AN
INTRODUCTION
TO
MINERALOGY:
OR, AN
ACCURATE CLASSIFICATION
OF
FOSSILS AND MINERALS,
VIZ.
EARTHS, STONES, SALTS, INFLAMMABLES
and METALLIC SUBSTANCES.

17N2

TO WHICH ARE ADDED

I. A DISCOURSE ON THE GENERATION OF MINERAL BODIES.
II. DR. LEHMAN'S TABLES ON THE AFFINITIES OF SALTS.
III. TABLES ON THE SPECIFIC GRAVITIES OF MINERAL BODIES.
IV. A VIEW of THEIR RESPECTIVE POWERS AS CONDUCTORS OF ELECTRICITY.

By JOHN REINHOLD FORSTER, F. A. S.
AND TUTOR IN THE MODERN LANGUAGES AND NATURAL
HISTORY IN THE WARRINGTON ACADEMY.

> Nulla res conſummata eſt dum incipit, nec in hac tantum re omnium maxima atque involuciſſima, in qua etiam cum multum actum erit, omnis tamen ætas quod agat inveniet.
>
> *Seneca Nat. Quæſt. L. vi. c. v.*

LONDON,
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24

Jos: Banks

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TO THE
PRESIDENT,
THE VICE-PRESIDENT,
THE TREASURER
AND
THE TRUSTEES
OF THE
WARRINGTON ACADEMY,
THIS INTRODUCTION TO
MINERALOGY,
AS THE FIRST PART OF A
COURSE OF PUBLIC LECTURES
ON
NATURAL HISTORY,
READ,
ACCORDING TO THEIR APPOINTMENT
IN THE ACADEMY,
BEING THE FIRST
INSTITUTION OF THIS KIND
IN THE KINGDOM,
IS INSCRIBED,
WITH THE GREATEST RESPECT,
BY THEIR
MOST HUMBLE
AND MOST
OBEDIENT SERVANT,
JOHN REINHOLD FORSTER.

Advertiſement.

WHEN *I ſat down to prepare the Lectures on Natural Hiſtory, which I have the honour of being appointed to read in this Academy; I found myſelf much at a loſs for an Engliſh book which I might make uſe of as a text. This was eſpecially the caſe with reſpect to Mineralogy.* Webſter's Metallographia *is of too early a date, and written upon too confined a plan to anſwer the purpoſe. The ſame objection lay in a great meaſure againſt* Dr. Woodward, *who could not be ſuppoſed acquainted with the modern improvements in this branch.* Dr. Hill's Natural Hiſtory of Foſſils *is too voluminous, and abounds with ſuch a number of unintelligible terms as made it very improper to be put into the hands of ſtudents, who are deſigned for a commercial life, and to whom this very important branch of knowledge ſhould be made as eaſy and acceſſible as poſſible.*

Mr. Da Coſt'a Book *is not yet perfected. On this account I found myſelf under the neceſſity of drawing up a ſhort ſketch of my own, adapted in the beſt manner I could imagine to the uſe of my Claſs. This which is now offered to the public be-*

longs only to the Mineral Kingdom; *and I ſlatter myſelf it will be found not only uſeful to ſtudents, but acceptable to ſuch as are concerned in mining and the various branches of metallurgy; and a proper guide to thoſe who amuſe themſelves in collecting foſſils, and would wiſh to diſpoſe and arrange their cabinets according to the order of nature.*

A whole Syſtem of Natural Hiſtory, upon the ſame plan, and drawn up with the ſame views is now in the preſs, and will be publiſhed the next winter.

It is neceſſary that I ſay ſomething in relation to Counſellor Lehman's Tables on the Affinities of Saline bodies, *which I have added.*

The Character and abilities of this Gentleman as a Chemiſt and Naturaliſt are too well known among the learned to need being mentioned here. I had the honour of receiving theſe tables from himſelf during my ſtay at Peterſburgh; *they are a part of his great work on mineralogy, written ſix years ago, by order of the Court of Ruſſia, for the uſe and inſtruction of the people engaged in the buſineſs of mining and aſſaying in that great empire.*

It was originally written in Latin and intended to be tranſlated into the Ruſſian Language; but the preſs of the Academy of Sciences there and the *direction of that illuſtrious body being in the hands of a man of mean and baſe ſpirit, the publication of this excellent work was ſtudiouſly prevented. As the Academy at* Peterſburgh *is now under the direction of* Count Orlof, *himſelf a man of great abilities, and a powerful patron of learning and learned men, it is probable the publication will no longer be delayed.*

In the mean time, if not by any thing of my own, by the publication of this, I may hope to be conſidered as a contributor to the progreſs of knowledge and improvement of the arts in the happy country where I now live.

J. R. F.

WARRINGTON,
March 1ſt. 1768.

INTRODUCTION.

A SYSTEM OF NATURAL HISTORY is a ſcientific enumeration of the natural bodies, which compoſe the ſurface of our globe.

GOD, is the ſupreme Lord and Creator of the univerſe, that is, of the ſpiritual and of the viſible world.

THE *viſible World*, is the compages of all actual things; it comprehends the heavenly bodies, the various elements, and this globe which we inhabit; and theſe together make up the *vaſt Empire of nature*.

THE knowledge of the heavenly bodies and their motions is the object of *Aſtronomy*.

THE *Elements* are the materials, of which the bodies of the viſible world, and particularly our globe, are compoſed, and are generally ſaid to be four, viz. *Earth*, *Water*, *Air*, *Fire*; the qualities, relations and proportions of theſe in the compoſition and decompoſition of bodies, are the objects of *Chemiſtry*.

THE inveſtigation of the laws by which the elements are governed, and the effects of the different applications of them, is the buſineſs of *natural Philoſophy*.

NATURAL bodies compoſed of the ſeveral elements, but which are merely aggregations without Organization, Life or Senſe, make up THE MINERAL KINGDOM.

THE other natural bodies have all *organization*, derived from an original germ, which is their principle of life: of theſe ſome have nothing but mere *life* or *vegetation*, and belong to THE VEGETABLE KINGDOM; others endued with *ſenſation* and *will*, form the third grand claſs, and are called THE ANIMAL KINGDOM.

B

To give exact and adequate definitions of theſe bodies, to expreſs each of them by proper and convenient names, to diſtribute them into their ſeveral claſſes, to learn the method of their generation qualities, economy, and manner of life, and to apply them to the various purpoſes of human ſociety, is the STUDY OF NATURAL HISTORY.

FROM this view of the ſubject, *the great utility* of natural hiſtory appears at firſt ſight; it confirms us in the belief of the *Exiſtence*, enlarges our ideas of the wiſdom and power, goodneſs and providence of the Supreme Being, and when ſeriouſly attended to, will leave the deepeſt and moſt laſting impreſſions of *religion* and *piety* on our hearts.

THE benevolent Creator of the world having ſubjected every thing here, below to the dominion, and deſigned them to be employed in the ſervice of mankind, it becomes us to be acquainted with the general properties of every thing around us, and the ſeveral important purpoſes to which they are capable of being applied. But this can only be done by careful obſervation, and an accurate ſtudy of nature; it is from this ſource we are to derive that knowledge of the powers of natural bodies, which can alone enable us to apply them in procuring the *neceſſaries*, or in adding to the *comforts* and *ornaments* of human life.

THE MINERAL KINGDOM.

MINERALS *(mineralia)* are bodies which grow by mere aggregation, according to laws peculiar to their reſpective natures, without organization, life and ſenſation.

THEY have *analogy* or ſimilarity of parts inſtead of Organization, *attraction of coheſion* inſtead of life, and *gravitation* inſtead of ſpontaneous motion.

Minerals may be divided into *Earths*, *Stones*, *Salts*, *Inflammables*, and *Metals*.

CLASSIS I.

EARTHS.

EARTHS *(Terra)* are compoſed of moderately coherent parts, which in water are reduced into a ſoft and looſe maſs.

EARTHS are *pure* or *mixed.* Pure earths are acted upon by acids, or not: the former are *Alcaline Earths*: the latter when put into the fire, and firſt harden and then vitrify, are called *Vitreſcent Clays*; but if they do not vitrify by fire, and being put into water, firſt diſſolve and then harden and become plaiſter, they are *Selenitic Earths*; but if neither acted on by acids, fire or water, they are *Apyrous.* The mixed earths are compoſed of the above-mentioned pure earths, and of different parts of other mineral, vegetable or animal bodies. Alſo we find *ſtony*, *ſaline*, *bituminous*, *metallic earths*, *mould* and *animal earth*.

SERIES I. PURE EARTHS. *(Terræ puræ)*

GENUS I. ALCALINE EARTH.

ALCALINE EARTHS, *(Terræ alcalinæ)* are pure earths, which are acted upon by acids, and when burnt give a good lime. We commonly meet with three kinds thereof, *Lime-Earth*, *Chalk*, and *Marle.*

1. LIME EARTH, *(Terra calcaria)* is an Alcaline Earth of a rough texture, white or yellowiſh colour and when burnt gives good lime.

2. Chalk, *(Creta)* is an alcaline earth, of a fine, compact texture white colour, fit to write with, and when burnt gives a lime.

3. Marle, *(Marga)* is an alcaline earth, of an unctuous looſe texture, of different colours, commonly white or aſh-coloured.

GENUS II. CLAYS

Clays, *(Terræ Argillaceæ)* are pure earths, which are not acted upon by acids; by a moderate degree of fire they harden into a ſtony ſubſtance; by a more intenſe they vitrify, and may be divided into *Potter's Clays*, *Medicinal Clays* or *Boles*, *Painter's Clays* or *Painter's Earths*, and *Mechanical Earths*.

1. Potters Clay, *(Argilla figulina)* is a viſcid, unctuous, heavy clay of different colours, often teſſelated, ductile while moiſt, but when burnt changes to a ſtony ſubſtance.

a The Common Loam or Brick Clay, *(Argilla latericia)* is a clay, containing many ſandy and ockery parts of different colours, but commonly yellow and reddiſh yellow.

b The Potters Clay, *(Argilla figulina ſtricte ſic dicta)* is of a finer and tougher texture, of different colours, commonly white, grey, yellow, red, blue, brown and black.

c The Porcelain Clay, or China Earth, (*Argilla Sinenſis vel Porcellana*) is the fineſt, ſofteſt clay of white, red and brown colour.

Note. The two laſt clays when burnt harden to a conſiderable degree and will ſtrike fire with ſteel.

2 Medicinal Clays, or Boles. *(Terræ Medicæ ſeu Boli)* are fat or unctuous clays; ſmooth and ſoft to the touch; diſſolve in water; and are principally white, yellow, red, green, brown and aſh-coloured. When dug out and purified they are commonly marked with a ſeal, and then are called Sealed Earths, *(Terræ Sigillatæ)* and from their native country, Lemnian Earth, *(Terra Lemnia)* Armenian Bole, *(Bolus Armena)* &c.

3 Painters Clays, or Earths. *(Terræ pictoriæ, Pigmenta)* are fine clays impregnated with coloured metallic ockres and may perhaps better be ranged among the *mixed earths*, and the *Metals*.

4. Mechanical Earths, (*Terræ mechanicæ*,) are fine, dry,

lamellated

mellated clays, diſſoluble in water, of different colours, principally white, grey, brown with a ſomewhat greeniſh caſt.

a Fullers Earth (*Smectis, Terra Cimolia, Terra fullonum*) is a greyiſh brown-coloured hard and denſe abſorbent clay, which froths in water, is therein at laſt diſſolved, and hardens in the fire.

b Fullers Clay, (*Argilla lamellata fullonum*) is a leſs fine lamellated clay, of the ſame quality with the former.

GENUS III. SELENITIC EARTHS.

Selenitic Earths or Plaister Earths (*Terræ Seleniticæ vel gypſaceæ*) are pure earths, which are not affected by acids, and when moderately heated and macerated again in water, grow hard to the conſiſtence of plaiſter, are of a rhomboidal texture and commonly of a dirty white.

GENUS IV. APYROUS EARTHS.

Apyrous Earths, (*Terræ Apyræ*) are pure earths, of a clayey texture, are not affected by acids, and when put into the fire never vitrify, without ſome additional body, and are of different colours; yellow, brown, pale blue, and blackiſh.

SERIES II. MIXED EARTHS. (*Terræ mixtæ*)

GENUS I. STONY EARTHS OR SAND.

Sand or Stony Earth (*Arena. ſ. Terra lapidoſa*) is one of the above-mentioned pure earths, mixed with ſome particles of ſtone of different colour and ſize; but as the ſtony parts are commonly prevailing, they are rather little ſtones, and belong to the following claſs.

1 Dust Sand (*Arena pulverulenta, Sabulum*) is the fineſt part of different ſtones and of different colours mixed with ſome earth.

2 Sands (*Arena ſtricte ſic dicta*) are the larger parts of different ſtones and of different colours, mixed with ſome earth.

3 Grits (*Glarea*) are the ſtill larger parts of different ſtones and different colours, mixed with ſome earth.

4 Gravels, (*Saburra*) are the largeſt parts of different ſtones and of different colours, mixed with ſome earth.

Genus

GENUS II. SALINE EARTHS.

SALINE EARTHS (*Terræ Salinæ*) are pure earths or ſand impregnated with ſome ſaline parts, and belong rather to Claſſis III.

GENUS III. BITUMINOUS EARTHS.

BITUMINOUS EARTHS, (*Terræ Bituminoſæ*) are pure earths impregnated with bituminous parts, and belong rather to Claſſis IV.

GENUS IV. METALLIC EARTHS.

METALLIC EARTHS, or **OCKRES,** (*Terræ Metallicæ*) are pure earths or ſands impregnated with metallic parts, and belong rather to Claſſis V.

GENUS V. MOULD.

MOULD, *or* **SOIL,** (*Humus*) is a pure earth or ſand mixed with putrified vegetables, and is of different colours, blackiſh, red and brown.

GENUS VI. ANIMAL EARTHS.

ANIMAL MOULD or **EARTH** (*Humus Animalis*) is an earth mixed with parts of diſſolved animal bodies, and is different in reſpect to the animals and animal parts which are mixed with it, and in reſpect to the ſtate which theſe diſſolved bodies are in.

CLASSIS II.

STONES.

STONES (*Lapides*) are compoſed of earthy, harſh, compact parts, of too ſtrong a texture to be diſſolved or reduced to a ſoft looſe maſs in water; they burn not in fire, and when melted give not an opaque, bright, convex Regulus.

Stones, are compoſed of homogeneous or of heterogeneous parts; the former, are *Simple Stones*, the latter are *Compound Stones*. Simple ſtones are acted upon by acids, or not; the firſt are *Alcaline Stones*, the latter vitrify, when put into the fire, or not; the former are the *Vitreſcent Stones*, the ſecond when taken out of the fire and macerated in water, diſſolve, and grow to a plaiſterous ſubſtance, or not; the firſt are *Gypſeous* or *Selenitic Stones*, the laſt are *Apyrous Stones.*

The compound ſtones are compoſed of heterogeneous parts of the mineral kingdom, or mixed with parts of the two other kingdoms, and are commonly called *Petrefactions*: thoſe which contain vegetable parts, are the *Phytolithi*; and the *Zoolithi* contain animal parts.

SERIES I. SIMPLE STONES *(Lapides ſimplices)*

GENUS I. ALCALINE STONES,

ALCALINE STONES, (*Lapides Alcalini*) are acted upon by acids; ſtrike not fire with ſteel, and burn into lime. They are of regular or irregular texture; *the firſt* are lamellated and rhomboidal, and are called *Alcaline Spars*; *the latter* are of a compact texture and take a fine poliſh, as the *Marbles*; or of a leſs compact and rough texture, without any remarkable indication of their generation, and reſiſt the influence of the external air, as *Lime-Stones*; or not, as *Marle Stones*; or they have indications of their generation, when they become ſolid by the dripping of water impregnated with calcareous parts, they are called *Dripping-Stones* or *Stalactites*; or formed porous, by the flowing of a calcareous water, and are called *Tophaceous Stones.*

1 ALCALINE SPARS, (*Spatum calcareum*) are alcaline ſtones of a lamellated and rhomboidal ſtructure.

Note. Spar, is a common name for all heavy ſtones of a lamellated, brittle ſtructure, which always conſiſt of ſemiopaque rhomboidal particles, different only in reſpect to the matter whereof they are compoſed. This matter when calcareous, makes Alcaline Spars; *when vitreſcent,* Vitreſcent Spars; *and when gypſeous,* Selenitic Spars.

a COMMON LIME SPAR, (*Spatum commune*) is opaque and ſcarcely of any regularity, becauſe the cubes of this kind of ſpar run very irregularly and are of different ſizes, and of different colours, as white, grey, and red.

b CUBIC SPAR, (*Spatum teſſelatum*) is opaque, heavy, of a ſtrong coherent texture, of all colours, and is compoſed of different rhomboidal cubes.

c **DIAPHANOUS SPAR,** (*Spatum diaphanum*) is diaphanous, cubic, a little rhomboidal, ſoft and of different colours.

d **ICELAND CRYSTAL,** (*Cryſtallus Iſlandica*) is diaphanous, cubic, lamellated, repreſents all objects ſeen through it, double (having a double refraction) and has the remarkable property of giving light in the dark, after being heated.

e **SPAR CRYSTALS,** (*Spatum Cryſtallinum*) are diaphanous, pyramidal and columnar cryſtals, which do not terminate in points.

2. **MARBLES,** (*Marmora*) are alcaline Stones of an irregular compact texture of different colours, and take a fine poliſh.

a **MARBLES,** *of one colour.*

α **WHITE,** (*Marmor Parium antiquorum.*)

β **BLACK,** (*Marmor Luculleum*) Nero antico, by the Italians.

γ **GREY,** (*Marmor Palumbinum*) Marmo Bigio o Pardiglio,

δ **RED, or BROWN,** (*Marmor rufum*) Roſſo antico.

ε **YELLOW,** (*Marmor flavum*) Giallo antico.

ϛ **GREEN,** (*Marmor Lacedæmonium*) Verdello.

ζ **BLUE,** (*Marmor coeruleum*)

b **VARIEGATED MARBLES,** *of two Colours.*

α **BLACK AND WHITE,** (*Marmor nigrum, venulis albis variegatum*) Bianco e Nero Orientale.

β **BLACK AND YELLOW,** (*Marmor nigrum et flavum*) Giallo e Nero,

γ **WHITE AND BLACK,** (*Marmor album maculis linearibus nigris*) Marmo ſcritto,

δ **RED AND WHITE,** (*Marmor rubrum, ocellis albis variegatum*) Occhio di Pavone antico.

ε **BROWN AND WHITE,** (*Marmor purpuraſcens, albis punctis notatum*) Roſſo brecciato antico.

ϛ **YELLOW, AND RED,** (*Marmor flavum rubro variegatum*) Giallo e Roſſo, o Giallo breciato antico.

ζ **GREEN AND WHITE,** (*Marmor Tiberium ſeu Auguſtum*) Verde antico.

η **GREEN AND BLUE,** (*Marmor viridepratinum*) Verde di prata.

c **VARIEGATED MARBLES,** *of three and more Colours,* are commonly, called **BROCATELLI.**

d Figurated Marbles, or Landskip-Stones (*Marmora picta)* Marble of Florence.

e Striated Marbles, (*Marmor polyzonias*).

3 Lime Stones, (*Lapides Calcarei*) are alcaline ſtones of a rough texture, of different colours, and reſiſt the influence of the air.

a Compact Lime Stone, (*Calcareus æquabilis*) is of the moſt compact texture, and of different colours.

b Glittering Lime Stone, (*Calcareus ſcintillans*) has ſmall heterogeneous glittering parts, and is of different colours.

c Granulated Lime Stone, (*Calcareus inæquabilis*) has larger heterogeneous parts, like grains, and is undulated or ſtriated.

d Lime Slates, (*Schiſtus calcareus*) are of a lamellated texture, and of different colours.

4 Marle Stone, (*Lapis Margaceus, Marga lapidea*) is an alcaline ſtone, of a rough texture, and moulders when expoſed to the air.

5 Dripping Stone, Stalactite, (*Stalactites*) is a ſolid, alcaline ſtone, formed by a dripping water, impregnated with calcareous parts, of different colours and has ſometimes a ſtriated or radiated texture.

6 Tophus, tophaceous Stones, (*Tophus ſ. Porus*) is a porous alcaline ſtone, formed by a flowing water, impregnated with calcareous parts.

Genus II. Vitrescent Stones.

Vitrescent Stones, (*Lapides Vitreſcentes*) are not acted upon by acids, vitrify when put into the fire, and ſtrike fire with ſteel.

Vitrescent Stones are of a regular figure, or not. The firſt are of a geometrical and columnar figure, quite diaphanous, very hard, commonly of more than ſix angles, theſe are *Gems*; or of leſs hardneſs, and not exceeding ſix angles, theſe are *Cryſtals*; or more opaque, rhomboidal and lamellated, and are called *Vitreſcent ſpars*; or merely lamellated, *Slates*. Thoſe of an irregular figure are of a ſimilar and compact, or uneven texture. The former are *Flints*, the latter *Quartz*.

1 Gems, (*Gemmæ*) are very hard, diaphanous vitreſcent ſtones of

a regular geometrical and columnar figure, commonly exceeding ſix angles and of different colours.

a **DIAMOND** *(Adamas)* without colour and of the greateſt hardneſs.

α THE DIAMOND *void of all colours*, is the moſt valuable.

β THE DIAMOND *with a blackiſh caſt*, is of inferior value.

γ THE DIAMOND *with a yellowiſh caſt*, is of the leaſt value.

THESE three differences are called by the Jewellers, the *water of the ſtone*; and they ſay a ſtone of the *firſt*, *ſecond* and *third water*.

THE *fire* or *luſtre* of a ſtone ſignifies the brightneſs of its reflections.

αα THE THICKSTONE, is a diamond, cut in ten faces, whereof five are a-top, and five at bottom, but they are no more in uſe, and are all converted into brilliants.

ββ THE BRILLIANT DIAMOND, is cut in faces both a-top and at bottom, and its table, or principal face a-top, is flat, or nearly flat: commonly it has twenty-four faces a-top, and eight or thirty-two at bottom.

γγ THE ROSE DIAMOND is quite flat underneath, and the upper part is cut in divers faces, commonly in triangles, terminating in a point.

δδ THE TABLE DIAMOND is that, which has a large ſquare face at the top, encompaſſed with four leſſer; or the half of the Thickſtone.

b **RUBY** (*Rubinus*) is the next in hardneſs to the Diamond, and is of a more deep or pale purple colour.

α RUBY, (*Carbunculus recentiorum*, *Pyropus antiquorum*) is carmine coloured and next in hardneſs to the diamond.

β SPINELL RUBY (*Spinellus*) is of a deeper carmine, than the true Ruby, but more dilute, leſs ſplendid and hard.

γ BALAS RUBY (*Balaſſus*, *Palatius*) is quite roſe-coloured, with a little blueiſh caſt.

δ THE RUBYCELL, (*Rubicellus*) is of a pale carmine red, mixed with yellow.

c **GARNET**, (*Granatus*, *Carchedonius*, *ſ. Garamanticus antiquorum*) is of a dull red colour, in hardneſs next to the Amethyſt.

α The bohemian garnet is of a deep red.

β The oriental garnet is of a red with a blueiſh caſt.

γ The spanish garnet, is of a yellowiſh red.

d Hyacinth (*Hyacinthus, Lyncurius antiquorum*) is red mixed with yellow, its hardneſs next to the Garnet.

α Vermillion (*Carbunculus antiquorum*) is of a fine vermilion mixed with carmine; the Italians call it *Giacinto Guarnaccino.*

β Hyacinth of *a reddiſh ſaffron colour.*

γ Hyacinth of *a reddiſh yellow amber colour* (*Chryſelectrum Plinii.*)

δ Hyacinth of *a honey colour* (*Mellichryſos Plinii.*)

e Topaz (*Topazius, Chryſolithus antiquorum*) is of a fine golden yellow colour, in hardneſs next to the Saphire.

α The oriental topaz, of a pale gold colour.

β The spanish topaz, of a deep gold colour.

γ The saxonian topaz, of a pale yellow,

δ The bohemian topaz, of a browniſh yellow colour,

ε The smoak topaz, of a dull brown colour, like as if it had been in ſmoak.

f Chrysolite, (*Chryſolithus, Topazius antiquorum*) is of a yellowiſh green, in hardneſs next to the Emerald.

α Palegreen chrysolite.

β Chrysoprase, of a green mixed with a yellow gold.

γ Prasius, is of a fine leek-green colour.

g Emerald (*Smaragdus*) is of a very pleaſant green colour, in hardneſs next to the Topaz.

α Oriental emerald, of a meadow-green permanent colour.

β Occidental emerald, of a richer green colour.

h Berill, (*Berillus*) by the jewellers called *Aqua-marin,* is of a colour mixed of blue and green, like the ſea in a fine day, in hardneſs next to the Hyacinth.

i Saphire (*Sapphirus, Cyaneus antiquorum*) is of a fine ſky colour, in hardneſs next to the Ruby.

α The rich blue saphire (*Sapphirus cyaneus.*)

β The pale saphire (*Sapphirus fœmina.*)

γ THE GREENISH SAPHIRE (*Sapphirus praſitis*)

δ THE WHITE SAPHIRE (*Leucoſapphirus*) of a milk colour mixed with blue.

k AMETHYST, (*Amethyſtus, Hyacinthus antiquorum*) of a violet purple colour.

α THE RICH VIOLET AMETHYST; the ſtones of this colour, are the moſt valuable, when they have a reddiſh caſt.

β THE AMETHYST *with a yellowiſh caſt.*

γ THE PALE AMETHYST.

δ THE REDDISH AMETHYST.

l THE OPAL (*Opalus, Pæderos Plinii*) is a ſemidiaphanous milk coloured gem, which reflects in different lights all the priſmatic colours.

α THE OPAL *with a pale carmine or roſe coloured caſt*, is the moſt valuable, and is only found among the ruins of the ancient cities.

β THE MOST DIAPHANOUS OPAL with all the priſmatic colours.

γ THE BLACKISH OPAL, with a caſt like a burning coal.

δ THE YELLOWISH OPAL, having the yellow the moſt predominant of its reflected colours.

ε THE GREENISH OPAL, which is very like to the eye of a cat, in the dark, and therefore called *occhio del gatto, the cat's eye.*

m TOURMALIN, TRIP, or ASHDRAWER, (*Lapis Tourmalenſis*) theſe are names of Gems of ſeveral colours, which in their primitive ſtate are priſmatic with prominent and inflected angles; and it hath been obſerved lately, that they have the quality of being electrified *plus* and *minus*. Their *poles* always occupy the extremities of the columns; acroſs the ſtone they are tranſparent, but from pole to pole they always are opaque.

α THE BROWN YELLOW TOURMALIN, is dark with a blackiſh caſt and comes from Ceylon.

β THE YELLOW TOURMALIN.

γ THE GREENISH TOURMALIN.

δ THE BLUE TOURMALIN.

ε THE RED TOURMALIN; theſe four laſt Tourmalins are tranſparent and come from Braſil.

2 Crystals (*Cryſtalli*) are diaphanous vitreſcent ſtones, of a regular, geometrical or columnar ſhape, they ſeldom have more than ſix angles; their hardneſs is leſs than that of gems, and they are of different colours.

- *a* Colourless crystals (*Cryſtallus montana*)
  - α Columnar crystal, *with one point* (*Cryſtallus priſmatica apice unico*)
  - β Columnar crystal, *with two points* (*Cryſtallus priſmatica utrimque acuminata*)
  - γ Double hexangular pyramidal crystal (*Cryſtallus amphipyramidata*)
  - δ Hollow crystal (*Cryſtallus cavitate hexangulari*)
- *b* Coloured crystals (*Cryſtalli coloratæ*)
  - α Ruby crystal.
  - β Hyacinth crystal.
  - γ Topaz crystal.
  - δ Chrysolite crystal.
  - ε Emerald crystal.
  - ς Berill crystal.
  - ζ Saphire crystal.
  - η Amethyst crystal.

3 Vitrescent spar (*Spatum Vitreſcens*) is a regular, rhomboidal, and lamellated vitreſcent ſtone, more opaque than the two precedent kinds and of different colours.

- *a* The common vitrescent spar (*Spatum vitreſcens commune*) is cubic and opaque, milk-white, blueiſh and greeniſh: the Bononian stone is a variety of this ſpar, ſhining in the dark, after being expoſed to the ſun, or heated, like *Phoſphorus*.
- *b* The cubic vitrescent spar (*Spatum vitreſcens cubicum*) conſiſts of diaphanous, cubic particles, ſometimes of fine bright colours and theſe are the Fluores, which take their name from the gem, which they imitate.
- *c.* Rhomboidal spar (*Spatum vitreſcens rhomboidale*) is only diſtinguiſhed from the former by its rhomboidal parts.
- *d* Lamellated spar, (*Spatum vitreſcens lamellatum*) is divided into ſlates, which ſtand upright, horizontal and croſs one another in all directions, and is white and fleſh coloured.

4 Slate (*Schiſtus*) is an opaque vitreſcent ſtone of a lamellated texture and of different colours.

- *a* The black table slate (*Schiſtus ater ſcriptura alba*) is a fine black coloured heavy ſlate, and when written on, the characters are white.

b THE BLUEISH GREY SLATE (*Schiſtus. ſ. Ardeſia tegularis*) is a hard blueiſh grey coloured ſlate of a quarter of an inch thick in its ſtrata.

c SHALE, BASS, OF SHIVER (*Schiſtus friabilis*) is a black ſlate of a looſe texture, commonly it ſtrikes in large ſtrata above the coals, and of different colours.

d SLATE FOR WHETSTONES (*Schiſtus coticula*) is a fine ſoft ſlate of different colours.

- *α* BLACK WHETSTONE.
- *β* GREY WHETSTONE.
- *γ* YELLOWISH WHETSTONE.

e GREY COARSE SLATE, (*Schiſtus rudis*)

f BLACK COAL SLATE, (*Schiſtus carbonarius*) it always forms the ſtratum above the coal.

g BLACK CHALK, (*Nigrica ſ. ſchiſtus pictorius*) is an earthy looſe ſlate, with which you may write on paper.

5 FLINT, HORNSTONE (*ſilex, lapis corneus*) is a vitreſcent ſtone of no regular ſhape, but an equal and compact texture, and when broken ſhews always a ſmooth ſurface, like a ſhell. There are two kinds of it,

a *Semidiaphanous,*

α *High coloured.*

ℵ CORNELIAN (*Carneolus, Sardius antiquorum*) is a fine ſemi-diaphanous high coloured flint, of a red colour, great hardneſs and fine poliſh.

1 THE FLESH COLOURED CORNELIAN.
2 THE YELLOWISH RED CORNELIAN.
3 THE BLOOD RED CORNELIAN.

ב CHALCEDONY (*Chalcedonius*) is more opaque, of a grey milky colour, mixed with other pale colours.

1 THE GREY AND GREEN MIXED CHALCEDONY.
2 THE GREY BROWN CHALCEDONY.
3 THE MILKY GREY CHALCEDONY.
4 THE PURPLE AND GREY MIXED CHALCEDONY, this is the beſt of all.
5 THE STRIATED AND SPOTTED CHALCEDONY.

ג ONYX, (*Onyx*) is a ſemiopaque flint with red and other coloured ſtriæ.

1 THE ONYX WITH CIRCULAR ZONES. *(Onyx ophthalmites)* is commonly of a high colour with many circular zones, including one of white, another black and brown colours.

2 THE ASTERIA *(Aſteria vera Plinii)* is an Onyx, ſometimes white, ſometimes having the colour of the nails of the fingers, with ſtars of the lively colour of the ſaphire or amethyſt, encompaſſed alternatively by other ſtars of the native colour of the ſtone.

3 THE MEMPHITES *(Memphites)* have parallel zones one above another, commonly black and white.

4 THE SARDONYX *(Sardonyx)* is an onyx wherein the zones are alternatively red, as in the cornelian.

5 THE EYE OF THE WORLD *(Oculus mundi)* is a yellowiſh grey onyx, which when put into the water, grows tranſparent and afterwards when taken out of the water again opaque.

7 AGATE *(Achates)* is a fine ſemiopaque flint, with a great variety of lines and ſpots of various colours.

β *Dull-coloured.*

THE COMMON FLINT *(Silex Pyrimachus)* is a dark coloured ſemiopaque flint, of various colours; black, whitiſh, grey, yellowiſh.

b *Opaque flints,*

α *of bright colours.*

JASPER, *(Jaſpis)* is an opaque bright coloured flint, admitting a fine poliſh.

1 JASPER OF ONE COLOUR *(Jaſpis unicolor)*

2 GREEN JASPER *(Malachites)* of a green colour, ſometimes veined or ſpotted with white, blue, red or black, and when heated, ſhines like Phoſphorus.

3 SPOTTED JASPER *(Jaſpis variegata)*

β *of dark colours.*

THE COMMON HORNSTONE, *(Petroſilex, Lapis corneus,)* is an opaque, rough, and dark coloured flint, which admits no poliſh.

6 QUARTZ, *(Quartzum)* is an opaque vitreſcent ſtone, of no regular ſhape, of a texture full of cracks, and of various colours.

a **The fine and pure quartz fluor** is tranſparent, but ſeldom in large pieces.

b **The common quartz** is like ice.

c **The impure quartz** is of different colours.

Note. All ſtones of the Hornſtone and Quartz kind, when of a ſmall ſize about five inches or under, are called **pebbles.**

Genus III. Gypseous or Selenitic Stones.

Gypseous stones *(Lapides gypſei)* are ſimple ſtones of a regular and looſe texture, are not acted upon by acids, do not vitrify in the fire, but when moderately heated, and afterwards macerated, firſt diſſolve and then become a *plaiſterous* ſubſtance.

Gypſeous ſtones are of a lamellated texture, the coarſe ones make up the *common gypſeous ſtones*; thoſe of a finer texture are *Alabaſters*; or they are of a rhomboidal texture, as *Selenitic Spars.*

1 **Common gypseous stone** *(Lapis gypſeus ſtricte ſic dictus, Gypſum,)* is a looſe coarſe ſtone of a lamellated fibrous ſtructure.

a **Lamellated gypsum,** or *Slates of Gypſum, (Gypſum lamellatum)* is a gypſeous ſtone of a lamellated texture which runs in all directions.

b **Fibrous** or **radiated gypsum,** *(Gypſum ſtriatum,)* is a gypſeous ſtone, compoſed of filaments, running in a perpendicular, oblique, or horizontal direction.

2 **Alabaster** *(Alabaſtrum)* is a lamellated fine gypſeous ſtone, which, when broken, glitters, and bears a fine poliſh.

a **White alabaster** *(Alabaſtrum candicans)*

b **Yellowish alabaster** *(Alabaſtrum luteſcens)*

c **Reddish alabaster** *(Alabaſtrum rufeſcens)*

d **Variegated alabaster** *(Alabaſtrum variegatum)*

3 **Gypseous or selenitic spar** *(Spatum gypſeum)* is a ſemiopaque, looſe, lamellated, but rhomboidal gypſeous ſtone, commonly of a greyiſh colour; its ſtrata generally run parallel, but ſometimes they come from a common center.

Genus IV. Apyrous Stones.

Apyrous stones *(Lapides apyri,)* are ſimple ſtones, which are not acted upon by acids, vitrify not in the greateſt fire, and when heated and ſoaked, will not form a plaiſterous ſubſtance.

Apyrous ſtones are of a regular, or irregular figure; the firſt are fibrous, or lamellated: the fibrous have longitudinal, pliable, light filaments; or, ſhort, rigid and heavy ones; the former are *amiants*; the latter *aſbeſts*. The lamellated are fat and diaphanous, or, opaque and rough. The former are called *talcs*; the latter are of a more diſtinct lamellated ſtructure, or not; one is called *glimmer*; the other *apyrous hornſtone*. Apyrous ſtones without any regular figure are *pot-ſtones*.

1 AMIANT (*Amianthus*) is a fibrous apyrous ſtone whoſe filaments run longitudinally, are pliable, and ſwim upon the water.

a MOUNTAIN FLAX, (*Linum montanum*) is an amiant of fine, looſely coherent, pliable, ſoft filaments.

b MOUNTAIN LEATHER (*Aluta montana*) is an amiant whoſe filaments are ſtrongly coherent, pliable, and interwoven with other filaments, which makes its texture lamellated, and is of a greyiſh colour.

2 ASBEST, (*Aſbeſtus*) is a fibrous apyrous ſtone, whoſe filaments, run longitudinally; but are ſhort, ſtiff, brittle, and do not ſwim upon the water.

a RIPE ASBEST, (*Aſbeſtus maturus*) is an aſbeſt, and quite the ſame with the mountain flax, except that it will not ſwim upon the water, and that its filaments are more ſtiff.

b UNRIPE ASBEST (*Aſbeſtus immaturus*) is an aſbeſt, whoſe parallel filaments are not eaſily ſeparated.

c PLUMOSE ASBEST, (*Aſbeſtus plumoſus ſ. Alumen plumoſum ſpurium*) is an aſbeſt, whoſe filaments are not eaſily ſeparated and are friable.

d STAR ASBEST (*Aſbeſtus ſtellatus*) is an aſbeſt whoſe filaments join in a centre.

e FASCICULATED ASBEST (*Aſbeſtus faſciculatus*) is an aſbeſt, whoſe filaments are joined in little faſciculi.

f THE PRICKLY ASBEST, (*Aſbeſtus aceroſus*) is an aſbeſt whoſe coarſe filaments look like chaff, or the beard of a corn-ear.

3 TALC, (*Talcum*) is a lamellated apyrous ſtone, whoſe flakes are diaphanous, fat, and friable.

a WHITE TALC (*Talcum argenteum*) is compoſed of ſemiopaque, pliable, fat, friable, ſoft flakes of a pearl colour.

b GOLD TALC (*Talcum aureum*) is compoſed of opaque, brittle fat flakes of a gold colour.

c GREEN TALC OR FRENCH CHALK, FRENCH MARKING STONE, CRAIEDE BRIANÇON, (*Creta hiſpanica, ſ. Briançonia, ſ. talcum viride*) is compoſed of ſemiopaque, greeniſh, fat lamellæ, with which you may mark cloth and other rough ſurfaces.

d CUBIC TALC (*Talcum cubicum, ſ. octaedrum*) is compoſed of eight-ſided pieces like alum.

4 GLIMMER (*Mica*) is a lamellated apyrous ſtone whoſe flakes are rough, friable, and commonly opaque.

a RUSSIAN GLASS, MUSCOVY GLASS, ISING GLASS, (*Vitrum ruthenicum, vitrum mariæ*) is a diaphanous glimmer pliable, and ſcaly and cleaves into innumerable thin flakes.

b CAT GOLD (*mica aurea*) is a ſemiopaque glimmer whoſe ſcales are of a yellow or yellowiſh red colour.

c CAT SILVER (*Mica argentea*) is only different in colour from the cat gold.

d COMMON GLIMMER, (*Mica communis*) is an opaque glimmer, whoſe ſcales lie in various directions from another, ſometimes undulated, ſometimes radiated, ſometimes like a part of a globe, ſometimes without order.

5 APYROUS HORNSTONE, (*Lapis corneus apyrus*) is an apyrous ſtone of a leſs diſtinct lamellated texture, commonly opaque and rough.

a THE SALBAND, (*Lapis corneus tunicatus*) is an apyrous ſtone which has a coloured covering, like leather, and is commonly found between the vein of the metalic ores and the common rock.

b HORNSTONE ROCK, (*Corneus ſolidus*) is hard, and looks like the hoof of a horſe, without regular texture and of various colours.

c HORNSTONE SLATE (*Corneus fiſſilis*) is lamellated, opaque and commonly runs perpendicularly, contrary to other ſlates, which run in a horizontal direction.

d SHERL, CRYSTALLINE HORNSTONE (*Corneus cryſtalliſatus*) is a lamellated, priſmatic, diaphanous hornſtone, of conſiderable hardneſs, and of different colours; it contains ſome particles of iron.

6 **Pot-stone** *(Lapis ollaris)* is an apyrous ſtone whoſe texture conſiſts of ſtrongly coherent and almoſt imperceptible lamellæ, filaments and grains, ſmooth and ſoft to the touch, may be turned and cut with iron tools, and acquires a greater hardneſs when put into the fire.

a **Soap-rock** *(Smectites)* is an opaque pot-ſtone, of a firm compact and regular texture, conſiderably weighty and hard, of a ſmooth and unctuous ſurface, and of different colours.

b **Bacon-stone,** *(Steatites)* is a ſemi-diaphanous pot-ſtone of a compact texture, harder than the ſoap-rock, takes a fine poliſh, and is commonly of a whitiſh, yellowiſh, greeniſh, and fleſh-colour.

c **Serpentine stone** *(Ophites, lapis colubrinus, marmor ſerpentinum)* is an opaque pot-ſtone of a compact texture, in hardneſs near by the ſame with the bacon-ſtone, commonly of a dark green colour, ſpotted with black and intermixed with particles of glimmer, and takes but an indifferent poliſh.

d **Hip-stone, nephritic stone** *(Lapis nephriticus)* is a ſemi-diaphanous pot-ſtone, of a looſe ſometimes lamellated or fibrous ſtructure, unctuous to the touch, is capable of a tolerable poliſh and of a green colour.

ADDITIONAL REMARKS.

Platina, or platina del pinto, juan blanco are different names given to a ſubſtance conſiſting of ſmall, ſhining, irregular, angulated, or circular and flat grains, about one twenty fourth part of an inch in ſize; whereof ſome are whitiſh, ſome livid; ſome of theſe are malleable, ſome brittle and ſome attracted by the magnet. No method has yet been found of reducing theſe grains by themſelves to a metallic regulus. They unite very readily with all metals, by a great degree of fire, but *it appears that the platina is only ſimply diſſolved by the metals in fuſion, and does not by their means become truly fuſible itſelf*; and therefore if the fire be not very violent, and the maſs in fuſion cools gradually, the grains of the platina ſubſide to the bottom of the veſſel and by the means of aquafortis, which corrodes the metals, the platina is left by itſelf in fine powder, and ſometimes has not undergone the leaſt alteration. However this union of the platina with metals has the remarkable quality of diminiſhing the malleability of them all, except in the inſtance of caſt iron, to which it communicates ſome degree of toughneſs. Platina is ſoluble in aqua regia, but not perfectly. The calx or the precipitate of platina will not vitrify either by itſelf, or by the addition of any of the glaſs, or vitreſcent bodies. Its union with gold is of ſuch a nature, that it cannot be ſeparated by the common ways of cementation, cupellation, quartation and fuſion through the regulus of antimony. When united with other metals it gives to the maſs a dull dark hue, but bears a good poliſh and never ruſts or tarniſhes. The addition of arſenic, when it is but one twenty fifth part, brings a ſmall quantity immediately in fuſion, but not a large one.

Note. All theſe remarks, are collected from the experiments of Dr. LEWIS, Meſſrs. MARGGRAF, MACQUER, SCHEFFER *and* LEHMAN, *and according to Counſellor* LEHMAN'S *obſervations it appears evidently, that platina is compoſed of nothing, but ſmall particles of an apyrous ſtone, which formerly were ſeparated from gold by the way of amalgamation, and then thrown away: this is ſtill more probable as it is ſaid to be found only in the old mines and the adherent particles of quickſilver, gold, iron and charcoal confirm this opinion. The ingenious and learned* Dr. LEWIS *reckons it among the metals*: noſtrum non eſt, tantas componere lites, *and therefore we rather chooſe to claſs it not at all, and mentioned it here at the end of apyrous ſtones, to avoid the appearance of omitting it.*

SERIES II. MIXED STONES. (*Lapides mixti*)

MIXED STONES, are compoſed of heterogeneous parts, the heterogenous parts are of a mineral kind, or of the other two kingdoms: theſe laſt are called *petrefactions*; the firſt are compoſed of earthy and ſtony parts, or of ſtony parts mixed with other minerals, as ſalts, bituminous and metallic parts. The former are *compound ſtones*; the latter *ſaline*, *bituminous*, or *metallic ſtones*, that is *ores*.

The *compound ſtones* are compoſed of homogeneous parts joined by a kind of a glue; when theſe homogeneous parts are ſandy, they are called *ſand-ſtones*; when of the tophaceous kind, *ſpawn-ſtones*; when pebbles, *pudding-ſtones*; but when the united parts of a compound ſtone are heterogeneous, it is a *rock-ſtone.*

Genus I. Compound Stones. *(Lapides compoſiti.)*

1 **Sand stone,** *(Lapis arenarius, ſ. ſaxum arenarium, ſabuloſum, Cos Linnæi)* is a compound ſtone of grains of ſand of different ſize, glued together.

- *a* **Turkish whetstone, or oil sand stone** *(Cos turcica)* is a ſand-ſtone compounded of the fineſt duſt ſand.
- *b* **Whetstone or scythe stone,** *(Cos arenaria minor)* is a ſand-ſtone compounded of common ſand.
- *c* **Mill-stone, grind stone** *(Cos molaris)* is a ſand-ſtone compounded of fine grit
- *d* **Sandy slate or flag,** *(Ammoſchiſtus, cos fiſſilis ſ. lapis arenarius fiſſilis)* is a ſand ſtone compounded of a fine grit, breaks in ſtrata, and is of various colours.
- *e* **Free-stone** *(Saxum arenarium, ſ. lapis glareoſus)* is a ſand-ſtone, compounded of a ſmall and moſtly angular grit, uſed for building, breaks in large ſtrata.
- *f* **Gravel-stone** *(Saxum ſaburroſum)* is a ſand-ſtone compounded of a ſmall gravel.
- *g* **Strain-stone, filtre-stone** *(Filtrum, lapis Mexicanus, cos poroſa, cos colatoria)* is a ſand-ſtone, compounded of a groſs grit whoſe texture is ſo lax, as to ſtrain water through it.
- *h* **Tripoly** *(Terra tripolitana)* is a ſand-ſtone, compounded of the fineſt ſand, mixed with chalky particles, which makes its texture very looſe; it is of a white, grey, blue and yellowiſh colour, and when burnt it ſtrikes fire with ſteel.

2 **Spawn-stone, fruit-stone, pease-stone** *(Oolithus, carpolithus, piſolithus)* is a compound ſtone of little round and oval grains from the ſize of a poppy ſeed, to that of a cherry kernel, commonly of a tophaceous ſtructure, glued together ſometimes by a hardened calcareous matter; ſome bear a very good poliſh.

3 **Pudding-stone,** (*Lapis concretus*) is a compound ſtone, whoſe

parts are pebbles of different colour, glued together with an other body, and bears a fine poliſh.

4 Rock-stones (*Saxa, petræ*) are compound ſtones of heterogeneous parts, ſome of two, ſome of three and even of more kinds, glued together, of various hardneſs and colours.

a Rock-stones of two kinds, (*Petra, ſ. ſaxum ſimplex*)

α Rock-stones, *compounded of lime-ſtone and ſpar.*

β Rock-stone *compounded of quartz and ſpar.*

γ Rock-stone *compounded of glimmer and hornſtone-ſlates.*

δ Rock-stone *compounded of glimmer and ſand-ſtone.*

ε Rock-stone *compounded of glimmer and quartz.*

ϛ Rock-stone *compounded of quartz and horn-ſtone-rock.*

b Rock-stone of three or more kinds, commonly quartz, vitreſcent ſpar and glimmer,

α The granite (*Granites, ſaxum granulatum*) is a rock-ſtone of great hardneſs and of fine bright colours which takes a fine poliſh.

א Porphyry, (*Pyrrhopoecilos, ſ. porphyrites*) is a granite, of the greateſt hardneſs of a *dark purple* colour, with black or white ſpots and admits a fine poliſh.

ב Granite, (*Granites ſtricte ſic dictus*) is a granite of great hardneſs, of white, red, green, yellow, or brown colour with white or black ſpots, admitting a very good poliſh.

ג Coral-stone (*Granites corallinus*) is a granite, of great hardneſs, whoſe parts are quartzs, cornelians, amethyſts and agates, and admits a fine poliſh.

ד Basalt or black-granite (*Baſaltes antiquorum*) is a granite of a dark greeniſh and ſometimes almoſt black colour, conſiſting of a mixture of very ſmall and almoſt imperceptible particles of different ſtones; its hardneſs is beyond conception, it grows always in joints forming polygonal columns, and admits a good poliſh.

β The large granulated rock-stone, (*Saxum granulis maioribus*) is a rock-ſtone whoſe integrant parts are large grains.

γ The fine granulated grey rock-stone (*Saxum granulis minoribus, ſ. ſaxum griſeum*) is a rock-ſtone whoſe integrant parts are of ſo ſmall a ſize that they give to the ſtone a dark grey colour.

δ THE VARIEGATED ROCK-STONE (*Saxum variegatum*) is a rock-ſtone whoſe parts are of different colours and are ſo diſpoſed as to give it the appearance of marble.

ε THE EQUALLY MIXED ROCK-STONE (*Saxum granulis anaticis*) is a rock-ſtone whoſe integrant parts are pretty equal in ſize and quantity.

GENUS II. STONES MIXED WITH SALTS, BITUMINOUS, AND METALLIC PARTS OF ORES (*Mineræ*)

1 SALT STONES (*Lapides ſalini*) are ſtones mixed with ſome ſaline parts, but belong rather to claſſis III.

2 BITUMINOUS STONES, (*Lapides bituminoſi*) are ſtones mixed with ſome bituminous parts and belong to claſſis IV.

3 METALLIC STONES (*Lapides metallici, mineræ ſtricte ſic dictæ*) are ſtones mixed with metallic parts, and belong to claſſis V.

SERIES III. PETREFACTIONS (*Petrefacta*)

PETREFACTIONS, are ſtones mixed with bodies of the two other kingdoms; the texture of their organic parts is throughly filled up with ſtony particles, ſo that they are ſtones and retain but the ſhape of the organic body; theſe are the TRUE PETREFACTIONS, (*Petrefacta ſtricte ſic dicta*); or the ſtony particles eſpecially thoſe of the tophaceous kind, have only formed a ſtony cruſt, including the organic body, which ſometimes is likewiſe petrified, ſometimes preſerved in its natural ſtate, ſometimes quite decayed; theſe are INCRUSTATIONS (*Incruſtata*); or the ſtony particles have in their ſoft ſtate taken an impreſſion of the organic body, and preſerve it ſtill in their ſtony ſtate, theſe are IMPRESSIONS (*Typolithi*)

Petrefactions contain bodies of the vegetable kingdom and are called *phytolithi*; or of the animal kingdom which have the name of *zoolithi*.

GENUS I. THE PHYTOLITES, contain parts

1 belonging to *fructification*, as
CARPOLITHI.
2 or thoſe belonging only to the *vegetation*, as
  a *Roots* (RIZOLITHI, OSTEOCOLLA)
  b *Wood* (LITHOXYLON)
  c *Leaves*, (LITHOBIBLIA) &c.

GENUS II. THE ZOOLITES.

1 contain quadrupeds, eſpecially
  a *whole bodies* of *quadrupeds* (TETRAPODOLITHI)
  b or parts, as
    α *Bones* (OSTEOLITHI)
    β *Teeth* (ODONTOLITHI) eſpecially when impregnated beſides the petrefaction, with ſome mineral particles, which burnt, colour them with a fine lively blue ſky colour, ſo that when poliſhed they are eſteemed and known by the name of an opaque precious ſtone called TURCOIS.
2 The petrified bodies or parts of *Birds* are called ORNITHOLITHI.
3 Thoſe of *amphibious* animals (AMPHIBIOLITHI) eſpecially the *teeth* of the *ſhark* called GLOSSOPETRÆ.
4 Thoſe of *fiſhes* (ICHTHYOLITHI) eſpecially
  a of their *back bones* (ICHTHYOSPONDYLI) and
  b their *dentes molares or the roofs of their mouths*, (BUFONITÆ)
5 Thoſe of *Inſects* (ENTOMOLITHI) eſpecially
of *crabs* (CARCINOLITHI)
6 Thoſe
  a of *worms* (HELMINTHOLITHI) eſpecially
    α of the *Sea-ſtar* (ASTERIÆ, CAPITA MEDUSÆ PETREFACTA)
    β of the *echinus* or *Sea-Egg*, (ECHINITÆ) and their *ſpikes*, LAPIDES JUDAICI, RADIOLI,
  b of the *ſhells*, CONCHYLIOLITHI.
    α eſpecially of the *multivalves*, as BALANI PETREFACTI.

β of the *bivalves*,

Ostracites.
Solenites.
Tellenites.
Bucardites.
Chamites.
Anomia petrefacta.
Mytilites.
Pinna marina petrefacta.

γ *Univalves*.

Nautilites.
Conites.
Turbinites.
Trochites.
Buccinites.
Strombites.
Nerites.
Muricites.
Helicites
Cornu ammonis.
Orthoceratites.
Patellites.
Dentalium *or* tubulus marinus petrefactus.
Serpulites.

ε of the *Corallines*

Madrepora.
Millepora.
Tubipora.
Encrinum petrefactum; its ſtalks are called Astroitæ, and its arms Entrochitæ.

CLASSIS III.

Salts, (Salia)

Ores are ſtony or earthy bodies mixed with ſaline, inflammable or metallic parts; ſometimes with one, ſometimes with two of theſe bodies, ſometimes with all.

Note. Becher *and his diſciple* Stahl, *have aſſerted that all bodies are compounded of watery, and earthy parts*; *the latter are of three kinds, of a vitreſcible, ſulphureous or mercurial principle.*

Salt in general, or a *ſaline ſubſtance*, in a chemical ſenſe, is compounded of a particle of water, intimately united with a particle of earth; and therefore every ſaline ſubſtance has an affinity with water and earth, and is capable of uniting with both, or either of them, whether they be ſeparated, or mixed together.

Salts alſo, in reſpect to mineralogy, are mineral bodies; ſoluble in water, fuſible in fire, attended with ſmoak during the operation, congealing again in little maſſes, of a regular figure, and affecting the tongue with a ſharp ſenſation.

Salts are ſimple or compound.

SERIES I. SIMPLE SALTS (*Salia ſimplicia, ſ. pura*)

THE SIMPLE SALTS partake more of the watery ſubſtance, have a ſour taſte and are called *acids:* or the proportion of earthy parts is greater in them than in acids, and have an acrid, fiery and ſweetiſh taſte, and theſe are called *alkalines.*

GENUS I. ACIDS (*Salia acida, ſ. Acida*)

ACIDS commonly appear in the form of a tranſparent liquor, though ſolidity is rather their natural ſtate; but their great affinity with water is the cauſe that theſe ſalts rapidly unite with the moiſt, and the aqueous particles of the air, and to this they chiefly owe their liquid ſtate. Acids have the property of changing all the vegetable blue and violet colours into red.

ACIDS are of three kinds; when the fluid particles of the acid are intimately united with a *vitreſcible earth,* it is called

1 THE VITRIOLIC ACID (*Acidum vitrioli, ſ. ſulphuris*).

When it is an *inflammable earth* they call it

2 NITROUS ACID, (*Acidum nitri*).

When it is a *mercurial principle,* it has the appellation of

3 MURIATIC ACID (*Acidum muriaticum, ſ. ſalis communis*)

Note. Beſides theſe, there is an acid, which is to be met with in vegetables and is therefore called the vegetable acid, but it falls not under the conſideration of mineralogiſts.

Theſe different acids have chiefly their denomination from *vitriol, nitre,* and the *muriatic* or *common ſalts,* becauſe thoſe acids are with moſt eaſe and in the greateſt quantity obtained from the abovementioned ſalts. The *vitrolic acid* is ſometimes called the *univerſal acid* or the *acid of ſulphur*.

GENUS II. ALKALINE SALTS (*Salia alcalina*)

ALKALINE SALTS OR ALKALIES are ſalts in which the earthy particles are more numerous, than in the acids; they have an acrid, fiery and ſomewhat ſweetiſh taſte,

Alkalis

Alkalies ſeldom appear in a cryſtalline ſubſtance, but form themſelves rather into poroſe glebes, or remain in a ſtate of powder.

Alkalies turn the blue and violet colours of vegetables into green, and when preſented to a pure acid, they ruſh together with violence, ebullition, hiſſing, heat and vapours.

Alkalies are joined to a fat or oily matter of a volatile, ſharp and diſagreeable ſmell, theſe are *volatile alkalies* or *volatile urinous ſalts* or *volatile urinous ſpirits*; or they are pure, and without this diſagreeable ſmell, and are called *fixed alkali.*

1 FIXED ALKALI (*Sal alcali minerale fixum, natrum antiquorum*) is an alkaline ſalt, which has no diſagreeable ſmell, and ſuſtains when dry the utmoſt violence of fire without flying off in vapours; it melts readily; attracts the moiſture of the air; appears ſeldom in a ſaline regular form, but is covered with a white powder, and beneath, it is lamellated; when boiled in water it riſes with the ſteam.

a NATRUM FROM EGYPT is a mineral fixed alkali, found in a concrete form in ſtrata in the lakes of *Medeby* and *Secte* in the *Sciathic* deſart.

b MACEDONIC NATRUM is formed in a lake in Macedonia, near the ancient city of *Clytus.*

c ASTRACHAN SALT is formed at the bottom of the lakes with common ſalt, in ſtrata which lie under the common ſalt.

d SALT FROM OCHOTSK is a greyiſh, white, fixed alkali, found in the clefts of rocks, near *Ochotſk*, a harbour upon the river *Ochota*, where it diſcharges itſelf into the ſea of *Kamtchatka.*

e PERSIC SALT is brought from Perſia in round cakes of a greyiſh white, ſometimes reddiſh colour, formed in ſtrata and mixed with ſand.

f APHRONITRUM VETERUM is found in and upon the walls of old buildings, of cellars, and ſometimes in the fields.

g ALKALINE WATER is ſometimes found in lakes and wells.

2 VOLATILE ALKALI (*Sal alcali volatile ſ. urinoſum ſ. ſpiritus volatilis urinoſus*) is an alkaline ſalt of a diſagreeable ſmell, which ariſes from the fat or oily matter produced by putrefaction; it flies oft when put into the fire, appears ſeldom in a cryſtalline form, and on account of its volatility is never to be met with in the mineral kingdom

a ALL THOSE MINERAL BODIES which contain a part of muriatic ſalt, *viz.* chalk, limeſtone, ſpar, *&c.* afford by diſtillation a part of this alkaline volatile ſalt; and even quick lime and common ſalt, when calcined, give a ſal ammoniac, which by diſtillation yields a volatile urinous ſalt.

b ALL WELLS, OF ALKALINE VOLATILE WATER, *viz.* the *Faulbrunn*, near Francfort upon the Mayne, and the well at *Lauchſtædt* in Saxony, contain a volatile alkali.

c It is principally found in the animal kingdom whoſe productions generally afford this volatile alkali.

SERIES II. COMPOUND SALTS. (*Salia media, mixta, ſ. compoſita*)

COMPOUND SALTS are ſaline bodies, which ariſe from the mixture of acids with other mineral bodies, and commonly appear under a regular geometrical figure.

Compound ſalts ariſe from the mixture of acids with metallic parts and are called *metallic ſalts*; or, with alcaline parts, and are called *ſaline* or *neutral ſalts*; or with earthy parts, and are called *earthy ſalts.*

GENUS I. METALLIC SALTS (*Salia metallica*)

METALLIC SALTS are cryſtallized mixtures of metallic parts and acids; they are *natural* and *artificial.* The natural belong to *mineralogy*; but the artificial to the hiſtory of arts, eſpecially *metallurgy* and *chemiſtry.*

Natural metallic ſalts are of as many different kinds, as the acids and metallic bodies made uſe of by nature in the production of them.

1 VITRIOLIC ACID mixed with

a ZINC, gives WHITE VITRIOL, (*Vitriolum zinci. ſ. album*) which is a white or roſe-coloured metallic ſalt, formed by the evaporated ſolution of zinc in the vitrolic acid.

b IRON gives GREEN VITRIOL OF COPPERAS, OF VITRIOL OF IRON, (*Vitriolum martis, ſ. ferri*) and is a green metallic ſalt, cryſtallized from an evaporated ſolution of iron in the vitriolic acid.

c COPPER gives BLUE VITRIOL OF VITRIOL OF COPPER, (*Vitriolum*

triolum cupri ſ. veneris) and is a metallic ſalt, formed in fine blue cryſtals from the evaporated ſolution of copper in the vitriolic acid.

2 AN ACID, not yet aſcertained, joined with a METALLIC SUBSTANCE, which is found in the ores of arſenic, gives

ARSENIC, which is a volatile, white, priſmatic, pyramidal, or rhomboidal metallic ſalt; it is yielded from a ſolution of the metallic ſubſtance in the arſenical ores, in an acid, which like the vitriolic acid acts upon the nitre by expelling its acid from its alkaline baſe: is ſoluble in water by boiling; volatile in fire and gives a ſmell like garlick, when put upon hot coals: with an alkali and the phlogiſton it gives a *metallic regulus.*

ARSENIC is found *native*, or *mineralized* with, ſulphur, iron and copper.

a NATIVE ARSENIC *(Arſenicum nativum)*

α SHARD-COBALT, *(Cobaltum teſtaceum, arſenicum nativum teſtaceum)* is a native arſenic having when broken a blueiſh and ſplendent colour, and conſiſting of ſmall flakes and ſhards like the coats of an onion; which, when ſeparated from the ſtone to which they adhere, are always hemiſpherical.

β WHITE ARSENIC *(Arſenicum album cryſtallinum et farinaceum)* is a native arſenic of a white colour, which ſometimes is tranſparent, ſolid, and cryſtalline, ſometimes under the form of a white powder.

b ARSENICAL ORES mineralized

α *with* SULPHUR make

1 ORPIMENT, *(Aurumpigmentum, Auripigmentum, Arſenicum citrinum)* which is of a foliated brittle texture, with intermixed flakes of glimmer; when broken it is ſplendent, but in general of a lemon-yellow, ſometimes greeniſh colour.

2 SANDARAC, REALGAR, *(Riſigalla, ſandaracha, realgar, arſenicum rubrum)* which is in nothing diſtinguiſhed from the former, but in the greater quantity of ſulphur which makes it an orange-yellow.

3 RUBY OF ARSENIC, *(Arſenicum cryſtallinum rubrum)* which is a cryſtalline, tranſparent, high-red ſubſtance, containing arſenic, and ſulphur.

β *with* A BITUMINOUS SUBSTANCE make

Black arsenic, *(Arſenicum nigrum piceum)* which is a blackiſh ore, containing arſenic mixed with mountain pitch; it has ſometimes a looſe and lamellated, ſometimes a ſolid texture.

γ *with* iron make

Arsenical pyrites, arsenical mundick, white pyrites, arsenic-stone, mispickel *(Minera arſenici alba, griſea, pyrites albus, griſeus, teſſera arſenicalis)* which are different names of a greyiſh white, arſenical ore, of a ſolid, ſometimes cryſtalline, ſometimes cubic texture, with ſplendent ſmall ſpeckles; it ſtrikes fire with ſteel accompanied with an arſenical ſmell, and contains iron, arſenic, and ſome ſulphur.

δ Arsenical earth *(Terra arſenicalis)* is a marle of a grey blueiſh colour, unctuous and impregnated with arſenical parts.

ε Arsenic is beſides found in

Cobalt-ore,
Biſmuth-ore,
Calamine-blend,
in ſome lead and tin-ores,
in ſome iron-ores,
in ſome copper-ores,
and in ſome ſilver-ores.

Genus II. Neutral or saline salts, *(Salia ſalſa, ſeu neutra)*

Neutral salts, are compound ſalts, ariſing from the mixture of acids with alkaline ſalts.

When alkaline ſalts are put into acids both theſe ſaline ſubſtances ruſh together with violence, ebullition, hiſſing, heat and vapours; and when there is juſt a ſufficient quantity of both that they may unite together, it is called *ſaturation*, or the *point of ſaturation* and this *point of ſaturation* makes the *neutral ſalts*. Whereas there are many acids and many alkalines, the ſaturated mixtures of theſe different acids and alkalines yield different neutral ſalts; ſome of them are native, ſome are only artificial.

1 Vitriolic acid, mixed with

a Fixed mineral alkali, makes

Sal mirabile *(Sal mirabile Glauberi)* which is a fixed neutral ſalt, forming oblong hexaëdral cryſtals. It is found native at the bottom of many lakes in Ruſſia, eſpecially in the lake *Azik-kul*, between the rivers *Yeniſea* and *Tom*, in the *Yeniſean* province.

b FIXED VEGETABLE ALKALI, gives

VITRIOLATED TARTAR, OF ARCANUM DUPLICATUM, OF SAL POLYCHRESTUM (*Tartarus vitriolatus, ſ. arcanum duplicatum, ſ. ſal polychreſtum*) this is an octoedral fixed neutral ſalt, made by art in different ways.

c VOLATILE ALKALI, gives

SECRETED SAL AMMONIAC, OF VITRIOLIC SAL AMMONIAC (*Sal ammoniacum ſecretum Glauberi*) which is a volatile, neutral, artificial ſalt without a peculiar regular figure.

2 NITROUS ACID mixed with

a FIXED MINERAL ALKALI, gives

CUBIC NITRE OF QUADRANGULAR NITRE (*Nitrum cubicum*) this is a fixed neutral ſalt, which forms quadrangular lozanges, and attracts the moiſture of the air very readily; it is formed only by art.

b FIXED VEGETABLE ALKALI, gives

SALT PETRE, OF NITRE, (*Nitrum, ſ. ſalpetræ*) which is a fixed neutral ſalt, which forms hexagonal priſmatic cryſtals, with long ſharp points.

α NITRE is found *native* and *ſolid* in the country of the eaſtern Khalmucks near the rivers *By* and *Katunya*, which form the river *Oby*, in the *Altay mountains*, where it is met with in a rock in of ſtrata the thickneſs of the back of a knife.

β Further, THE EARTH in India, Egypt, upon the banks of the Volga in Ruſſia and in many other places is impregnated with nitrous particles from putrified vegetables and animals, which extracted by water, boiled and cryſtallized give ſalt petre.

c VOLATILE ALKALI gives

NITROUS SAL AMMONIAC, (*Nitrum flammans*) which is a volatile neutral ſalt, made by art, without an appropriated figure.

3 MURIATIC ACID mixed with

a FIXED MINERAL ALKALI, gives the

MURIATIC SALT OF COMMON SALT (*Sal commune regeneratum ſ. ſal muriaticum*) which is a fixed neutral ſalt, forms regular cubic cryſtals, and is found native, as α Rock salt, fossil salt (*Sal gemmæ*) which is a muriatic ſalt found quite ſolid in large ſtrata, like a rock, or ſtone, in England, in Spain, in Poland, in Hungaria, in Tranſylvania, in Ruſſia, in Africa, and in America. Part of it is cryſtalline and pure, part mixed with ſome other bodies.

β Lake-salt, (*Sal lacuſtre*) is a muriatic ſalt found ſolid in ſtrata from three to four inches thick, at the bottom of large lakes, filled with brine, which by the heat of the ſun in ſummer time cryſtallizes and ſubſides in ſtrata. This ſalt is common in Ruſſia, eſpecially in the government of Aſtrachan, in the great Khalmuck deſart between the rivers Yaik and Volga. The lake *Yelton*, which is ſixteen Engliſh miles long and ten broad, is ſufficient to provide the European part of Ruſſia with this commodity, no leſs than fifty thouſand tuns thereof being dug every year out of this lake.

γ Bay-salt, sea-salt (*Sal marinum*) is a muriatic ſalt formed in large ſalt-marſhes, near the ſhore of the ſea from the introduced and evaporated ſea-water.

δ Fountain salt (*Sal fontanum*) is a muriatic ſalt, formed by boiling the brine of ſalt-ſprings, which when not ſtrong or rich enough to be boiled without a conſiderable conſumption of fuel at great expence, is poured over a declivity, made of ſpray-faggots, by which means the brine loſes what they call the *wild water*, and the proportion of the ſalt to the water increaſes conſiderably, ſo that it requires leſs fuel in boiling: the whole operation they call in Germany *graduation*. Salt ſprings are very common in England, *viz.* in Cheſhire, Worceſterſhire, Staffordſhire, Hampſhire, Northumberland; in Germany at Luneburg and all places called *Hall*; as Hall in Saxony, Hall in Tyrol, and Hall in Suabia; in France, in Ruſſia, &c.

b With vegetable alkali, gives

Digestive salt, (*Sal digeſtivum ſeu febrifugum Sylvii*) a fixed neutral ſalt, which forms cubes like the common ſalt and is only artificial.

c With volatile alkali, gives

Sal ammoniac (*Sal ammoniacum, ſ. ſal ammoniacum regeneratum*) which is a volatile neutral ſalt, without a regular figure, which is found α NATIVE, in rocks of a reddiſh colour, five days journey eaſt from the town of *Taſhkent* in the mountains of Turkeſtan towards the country wherein formerly lived the eaſtern or *Ziungurian* Khalmucks.

β NEAR ALL THE VOLCANOS, where it has various colours as white, red, yellow, green and black; but it is not ſo pure as the former, being mixed with ſulphur, vitriol, and other bodies.

γ ARTIFICIAL SAL AMMONIAC is made in great quantity in Egypt, from ſoot collected from burning the dung of animals, in the firſt months of the year.

4 ALL THE ACIDS mixed with
BORAX give the
SEDATIDE SALT, (*Sal ſedatiuum*) which is a fixed artificial neutral ſalt, expelled from the borax by the union of one of the acids, with the mineral fixed alkali of the borax. *The Sedative Salt* is in reſpect to its cryſtallization, and not changing the colour of ſyrup of violets, *a neutral ſalt*; but in regard to alkalies, with which it forms a true neutral ſalt, and in diſcharging the acid of ſuch neutral ſalts, which have not the vitriolic ſalt, it acts like *an acid*.

GENUS III. EARTHY SALTS (*Salia media terrea*)

EARTHY SALTS are compound ſalts ariſing from the mixture of acids, with an earth of the abſorbent kind.

VITRIOLIC ACID with
1 AN ALKALINE EARTH forms
SELENITES (*Selenites, lapis glacialis, ſpecularis, lunaris, Glacies Mariæ*) which is a lamellated, rhomboidal, earthy neutral ſalt, which does not effervеſce with acids; when calcined, it loſes its tranſparency; is ſoluble, when boiled in water, but as it cools, again reſumes its ſolid form and is depoſited in a powder at the bottom of the veſſel. It is found native, white, yellow, and of different colours, in Germany, Ruſſia, and in many other places· But it is poſſible to make artificial ſelenites.

2 AN ABSORBENT EARTH, which is met with in clays, and is not yet well known, gives

Alum *(Alumen)* which is an octogonal earthy neutral ſalt; it ſwells and puffs up when expoſed to the fire, and when all the water by this calcination is evaporated, it crumbles to a white powder, very difficult to fuſe and is called *burnt alum.*

a **Solid alum** is found ſometimes in ſtrata, ſometimes cryſtallized.

b **Feather alum, or plumous alum,** *(Alumen plumoſum verum)* grows out of rocks impregnated with alum in white parallel featherlike fibres.

c **Aluminous earth** *(Terra aluminaris)* is a lamellated inflammable, clayey earth, of a black, brown, or white colour.

d **Aluminous slate** *(Schiſtus aluminaris)* is a kind of ſlate full of inflammable ſulphureous particles, of a white, blueiſh, brown, or blackiſh colour, impregnated with alum.

e **Aluminous limestone** *(Calcarius aluminaris)* is a kind of limeſtone, which contains that kind of abſorbent earth, which is fit for making alum. This ſtone when calcined and ſoaked, crumbles in pieces and yields the alum called *Alumen Romanum,* or *reddiſh alum,* or **rock-alum.**

f **Aluminous pitcoals.**

g **Aluminous pyrites.**

h **Aluminous calamine stone.**

i **Aluminous springs.**

Alum is extracted from all theſe minerals by impregnating the water of rains, to which they are expoſed, with them, by boiling and cryſtalizing.

3 **Sedative salt,** a refractory abſorbent earth, which is not yet well known, and mineral fixed alkali, make

Borax *(Borax, Borech Arabum)* which is an earthy neutral ſalt, which forms irregular hexagonal priſmatic cryſtals, it ſwells and puffs up, when expoſed to the fire, melts very readily and takes the form of glaſs. The ſedative ſalt and mineral fixed alkali are the conſtituent parts of borax: but as the firſt is not yet well known, we cannot judge of the origin of borax.

Tinkal, which is a hard and heavy ſaline maſs of a blueiſh colour, diſſolves not eaſily in water, has a fatty appearance, is mixed with ſand and earthy particles, melts readily in fire, without great ſwellings, and is the ſubſtance from which in *Venice* and *Amſterdam* they refine the borax. This ſubſtance is brought from the Eaſt-Indies and its origin is not yet aſcertained, nor the manner of refining it into borax,

CLASSIS IV.

INFLAMMABLES

INFLAMMABLES *(Inflammabilia, bitumina, ſ. ſulphura)* are mineral bodies, which are not ſoluble in water, but burn without any addition in fire, and affect the ſmell during the operation.

Inflammables are more pure, or leſs; the firſt are ſolid, or not; the ſolid inflammables when burnt are odoriferous or ſtinking. The odoriferous inflammables are hard and brittle, or ſoft and tough; the firſt are called *yellow ambers*, the ſecond *ambergreaſe*. The ſtinking ſolid inflammables are of a dark colour, and ſtink when burnt; or of a clearer colour and yield a ſuffocating pungent ſmell when burnt; the firſt is *mountain-pitch*, the ſecond is *ſulphur*.

Thoſe inflammables, which have no ſolid texture, are fluid or merely unctuous. The fluid inflammables are thin and clear, or thick and brown; the firſt is called *naphtha* or *mountain-balm*; the ſecond is the *petroleum*, or *mountain-oil*. The unctuous inflammables, are black and tough *mountain-tar*; or more ſtiff and ductile *mountain-wax*.

I. PURE INFLAMMABLES.

SERIES I. INFLAMMABLES WITHOUT SOLIDITY.

INFLAMMABLES WITHOUT SOLIDITY *(Inflammabilia non ſolida)* are compoſed of a mineral oil, a ſmall quantity of a volatile acid of a kind which is diſtinct from the vegetable and all the other above-mentioned acids, a little earth, and a little phlegm, or watery particles; and the only difference conſiſts in the proportion in which theſe conſtituent parts are mixed together.

1 NAPHTHA OR MOUNTAIN BALM, *(Bitumen minerale fluidiſſimum, Naphtha)* is a tranſparent liquid inflammable, ſwimming upon the ſurface of almoſt every liquor; it attracts fire at a diſtance, and has a remarkable affinity with gold diſſolved in aqua regia.

2 PETROLEUM OR MOUNTAIN OIL *(Petroleum, Oleum montanum)* is a liquid inflammable of leſs fluidity and a brown or yellowiſh co-

lour, is heavier than the naphtha, attracts neither fire, nor diſſolved gold.

3 **MOUNTAIN-TAR** *(Maltha, axungia montana)* is an unctuous, black and tough inflammable, in whoſe compoſition more earthy particles are mixed.

4 **MOUNTAIN-WAX**, *(Cera montana, Ampelitis Plinii)* is an unctuous, brown or blackiſh inflammable, more ſtiff and ductile than mountain-tar, and has beſides the other integrant parts of the inflammables without ſolidity, a wax-oil, like to that which is ſeparated from *bees-wax*.

SERIES II. SOLID INFLAMMABLES.

SOLID INFLAMMABLES *(Inflamabilia ſolida, ſ. bitumina ſolida)* are of two kinds in reſpect to their integrant parts. One part has a peculiar acid very ſimilar to the muriatic, but intimately united with ſome fat or bituminous particles and is called the *acid of amber*. The other kind has a true vitriolic acid and this is only in the true ſulphur, all the other ſolid inflammables partake more or leſs of the acid of amber.

GENUS I. YELLOW AMBERS.

1 **AMBER, YELLOW AMBER** *(Succinum, Electrum, Gleſſum Plinii, Ambra citrina, Karobba Perſarum)* is an odoriferous ſolid inflammable of a tranſparent or ſemiopaque, hard and brittle texture and bears a fine poliſh.

a **TRANSPARENT AMBER** *(Succinum pellucidum)*
  - α WHITE TRANSPARENT AMBER.
  - β PALE YELLOWISH TRANSPARENT AMBER.
  - γ LEMON COLOURED TRANSPARENT AMBER.
  - δ GOLD-YELLOW TRANSPARENT AMBER. *(Chryſelectrum Plinii)*
  - ε RED TRANSPARENT AMBER,

b **OPAQUE AMBER** *(Succinum opacum)*
  - α WHITE OPAQUE AMBER.
  - β YELLOW OPAQUE AMBER.
  - γ RED OPAQUE AMBER.

c **COLOURED AMBER.**

α GREENISH AMBER.

β BLUEISH AMBER.

γ VARIEGATED AMBER.

2 MINERAL COPAL, (*Gummi copallinum minerale*) is a white, yellow, and ſometimes brown, ſolid, odoriferous inflammable, ſometimes tranſparent, ſometimes impure and opaque and is ſofter than the common yellow amber.

Note. *This copal muſt be diſtinguiſhed from the* vegetable gum copal *which is the milky indurated juice of the* Rhus copallinum LINNÆI *and grows in North-America.*

GENUS II. AMBERGREASE.

AMBERGREASE (*Ambra griſea*) is a quite opaque, ſolid, odoriferous inflammable of a ſoft but tough texture.

1 AMBERGREASE (*Ambra griſea marina*)

a SPOTTED AMBERGREASE (*Ambra griſea variegata*)

α AMBERGREASE WITH YELLOW SPOTS.

β AMBERGREASE WITH BLACK SPOTS.

b AMBERGREASE OF ONE COLOUR (*Ambra griſea unicolor*)

α WHITE AMBERGREASE.

β YELLOW AMBERGREASE.

γ BROWN AMBERGREASE.

δ BLACK AMBERGREASE.

2 MINERAL MUMMY (*Mumia mineralis*) is a black, ſolid, ſhining, almoſt inodorous inflammable, of a brittle texture, the higheſt traumatic ever yet known, in the eaſt its value is equal to gold.

GENUS III. MOUNTAIN-PITCH.

MOUNTAIN-PITCH (*Pix montana, ſ. Aſphaltum*) is a ſtinking dark coloured ſolid inflammable.

1 ASPHALT, JEWS-PITCH, (*Piſſaſphaltum*) is the cleaneſt ſort of mountain-pitch of a blackiſh colour, brittle and gloſſy and ſwims upon the water.

2 JET (*Gagates*) is a clear ſort of mountain-pitch, which has the fineſt earth in its compoſition, is black and takes a very good poliſh.

3 **PIT-COAL** (*Lithanthrax, Schiſtus bituminoſus*) is a ſolid black or blueiſh and gloſſy mountain-pitch, mixed with a greater quantity of earth, and of a lamellated texture.

a **KANNEL COALS** are of a finer and harder texture than the reſt of pit coals, they burn like a candle and break in large maſſes.

b **SEA COALS**, or **NEWCASTLE COALS**, are remarkably friable and therefore generally ſmall and cake on the fire.

c **CORNWALL-COALS** burn clear, without a great deal of ſmoak.

d **BENCH-COAL, SLIPPER-COAL, SPIN-COAL, STONE-COAL, FOOT-COAL, HEATHEN-COAL**, are names of different ſtrata of coals at Dudley in Staffordſhire, which have between them a *bat* or *bed* of a peculiar ſort of matter, about the thickneſs of a crown piece.

GENUS IV. SULPHUR. (*Sulphur*)

SULPHUR, BRIMSTONE is a ſolid, brittle inflammable, of a pale yellow colour, which burnt yields a penetrating ſuffocating ſmell. Sulphur is compoſed of fine earthy particles, ſome phlegm, an inflammable principle and vitriolic acid, which makes the difference between this body and all the others of the ſame kind; it does not ſwim upon the water, melts readily without burning and when put to the fire burns with a blue flame and a pungent ſuffocating ſmell, which is the volatilized vitriolic acid.

1 **PURE NATIVE SULPHUR** (*Sulphur nativum purum, ſ. vivum*)

a **CRYSTALLINE SULPHUR** (*Sulphur virgineum*) is a tranſparent ſulphur of a fine lemon-colour and like the yellow amber.

b **OPAQUE PALE YELLOW SULPHUR** (*Sulphur nativum citrinum, opacum*)

c **HAIR-SULPHUR** (*Sulphur vivum capillare*) is a native ſulphur attached to the crevices of vulcanos, in the ſhape of fine hair.

d **FLOUR OF SULPHUR** (*Flos ſulphuris*) is a fine powder of native ſulphur ſwimming upon the ſurface of ſome hot wells.

2 **IMPURE NATIVE SULPHUR** (*Sulphur nativum impurum*)

a **WHITE MIXED SULPHUR** (*Sulphur variegatum album*) is commonly mixed with a calcareous earth or alum.

b **Grey mixed sulphur** (*Sulphur variegatum cinereum*) is mixed with a grey clay.

c **Greenish mixed sulphur** (*Sulphur variegatum viride*) is mixed with other bodies thrown up by the volcanos.

d **Blackish sulphur** (*Sulphur variegatum nigrum*) is mixed with mountain-oil or pitch.

3 **Pyrites, mundick, sulphureous mundick, or maxy** (*Pyrites, pyromachus veterum*) is a pale yellow, glittering ore containing ſulphur and iron of an irregular ſhape, ſtrikes fire with ſteel, when put in the fire burns with a blue flame, and a ſuffocating vapour.

a **Solid pyrites,** (*Pyrites continuus ſolidus*) this is a pyrites whereof whole mountains are to be found.

b **Pyriteous nodules** (*Pyrites globoſus*) are pyrites ſometimes of a ſtriated radiated or lamellated texture found in other minerals in globes or nodules.

4 **Marcasites** (*Marcaſitæ, cryſtalli pyritaceæ*) are pyrites, which appear in a regular form like cryſtals, contain ſulphur, iron and copper, ſtrike fire with ſteel, and when put into the fire, change into red or brown; they are of all ſhapes, tetraëdra, hexaëdra, octoëdra, &c. lamellated, tubuloſe, &c.

5 **Liver pyrites, or water pyrites** (*Pyrites aquoſus, hepaticus, fuſcus*) is a pyrites of an irregular ſhape, liver-coloured, and contains more iron than ſulphur, ſome arſenic, and no copper.

6 **Black lead** (*Molybdæna*) which, according to late experiments, appears to be a ſulphur ſatiated with iron and tin, and contains ſometimes four parts ſulphur in five parts black lead, the reſt yielding more then ſeven parts iron and tin in ten parts of calx: ſometimes there are more then nineteen parts in twenty of ſulphur and the reſt is a metalic calx.

7 **Sulphureous water**; (*Aquæ ſulphureæ*) ſome wells have ſulphureous particles.

8 **Sulphur** is beſides in

a *The deeper yellow pyrites,* which commonly contain copper.

b *The white or arſenical pyrites.*

c *In cinnabar-ore.*

d *In realgar.*

e *In orpiment.*

f *In copper-nickel.*

g *In antimonial ores.*

h *In the blue and green copper-ores* and in many other mineral bodies.

II. LESS PURE INFLAMMABLES. (*Inflammabilia minus pura*)

1 **DEW-COALS, LAMELLATED OR FIBROUS EARTH** are commonly called **FOSSIL WOOD**, (*Lignum foſſile*) is a fibrous lamellated earth, mixed with a bituminous ſubſtance, and burns with a very diſagreeable ſmell, is brittle and friable and has frequently cryſtals of vitriol.

2 **TURF** (*Terra bituminoſa, ceſpes bituminoſus*) is an earth more or leſs ſolid, filled with bituminos particles.

a **SOLID TURF** (*Gleba bituminoſa*) is a ſolid, gloſſy, very heavy turf, ſometimes artificial.

b **LOOSE EARTHY TURF** (*Humus bituminoſus*) is a turf, formed of earth impregnated with bituminous parts.

c **HEATH-TURF, FLAW-TURF, PEAT** (*Ericeta bituminoſa*) is a concrete of roots of heath and moſs, ſwampy earth, and bituminous parts.

d **RUSH-TURF** (*Ceſpites bituminoſi*) is a turf, formed by rotten leaves and roots of ruſh, reed, and other aquatic plants.

3 **UMBRE, BLACK WADD,** (*Umbria terra*) is a brown kind of clay, impregnated with bituminous parts, which make it burn with a diſagreeable ſmell.

4 **STINK-STONE** (*Lapis ſuillus, ſ. ſpatum opacum frictione fœtidum*) is an opaque, lamellated, or radiated kind of alcaline ſpar, impregnated with a good deal of bituminous parts and a volatile unctuous alkali, which gives the ſtone a peculiarly diſagreeable nauſeous ſmell when burnt or rubbed.

a **PRISMATIC STINK-STONE.**

b **RADIATED STINK-STONE.**

c **SPHERIC RADIATED STINK-STONE.**

CLASSIS V.

METALS *(Metalla)*

METALS IN GENERAL OF METALLIC SUBSTANCES are heavy, glittering, opaque, fuſible bodies, which after fuſion congeal in a convex ſurface, called *regulus.*

Metallic ſubſtances conſiſt of a vitrifiable earth, united with an inflammable and beſides, a third principle called mercurial earth.

Metallic ſubſtances are malleable and ductile, that is, have the property of ſtretching under the hammer, and being extended to a greater length without breaking, and thoſe are called *metals*; or they have not any malleability and ductility, and theſe are *ſemi-metals.*

SERIES I. METALS. *(Metalla veri nominis)*

METALS, when expoſed to the action of a violent fire, ſuffer damage and change, and may be, by this means, deprived of their phlogiſton or inflammable principle, and conſequently loſe their metallic form and be reduced to a *metallic calx*; or they will not ſuffer from the moſt violent fire. The latter are called the *noble metals*, the firſt are the *baſe metals.*

GENUS I. GOLD, *(Aurum, Sol)*

GOLD is a noble metal of the greateſt ſolidity, weight, toughneſs and ductility, of a fine yellow colour and ſplendour, ſoluble only in aqua regia, liver of ſulphur, and quick-ſilver.

Gold is always found in its native ſtate, ſpeckled in ſmaller or larger maſſes in the ſtones and earths, which are called its ores; except when it is mixed with ſome other ſilver or copper-ore, but this is always in ſmall quantities.

1 GOLD-ORES IN GENERAL are ſtones or ores, wherein the native gold is to be found in ſmall grains, or in ſmall leaves, or in the ſhape of ſmall branches, or as a thin exhalation adhering to the ſtone; the gold ſometimes appears in its natural colour, ſometimes covered with a lead coloured ſkin.

GOLD-STONE is native gold adhering to various ſtones, as lime ſtone, black or green marble, ſpar, cryſtal, talc, cat-gold, ſherl; particularly *gold* is very frequently in white quartz, and hornſtone-ſlate.

b GOLD-ORES are ſuch ores, as contain ſome ſpeckles and particles of gold; moſt commonly it is mixed with the pale yellow and greeniſh copper-ore, which is fixed to quartz, with the lapis lazuli, and with cinnabar-ore. Gold is found, but in leſs quantity in glaſs ſilver, red-gilder, and white-gilder, in copper-ore, iron-ore, calamine-blend, antimony-ore, and arſenic-ſtone.

2 WASH-GOLD OF LAVATORIES GOLD, are grains or ſmall flakes of native gold of various ſizes found in various earths or ſands, and in the beds of rivers, and ſeparated from them by waſhing.

a GOLD-CLAY and GOLD-MARLE are particles of gold mixed with clay or marle.

b GOLD-SAND are particles of gold mixed with the ſand of rivers, and moſt commonly found in their windings and turns.

c GOLD-SHERL are grains or flakes of gold, found mixed in ſand, conſiſting of grains of tranſparent, red, black or lead coloured ſherl.

GENUS II. SILVER. (*Argentum, ſ. Luna*)

SILVER is a noble metal, of great ſolidity; in weight next to lead; its ductility and toughneſs are the next to that of gold; its elaſticity is leſs than that of copper and iron, but greater than that of lead, tin and gold; its ſonorousneſs is very near to that of copper, but more agreeable; of a white ſplendent colour, and ſoluble in aqua fortis or acid of nitre; but not in aqua regia.

Silver is found *native* and *mineralized* with ſulphur, arſenic, copper, iron and lead.

1 NATIVE SILVER, OF BOORS-ORE is to be found in various ſhapes, like thread, hair, wool, flakes, grains, branches, teeth and ſometimes in large maſſes fixed to ſpar, quartz, hornſtone-ſlates, and ſand ſtone; beſides theſe ſtones it is attached ſometimes to

glaſs-ore, red-gilder-ore, lead-ore, iron-ore and tin cryſtals.

2 MINERALIZED OF SILVER-ORE

a GLASS-ORE OF VITREAN SILVER *(Minera argenti vitrea)* is a rich ſilver-ore, containing commonly one-fourth of ſulphur and three-fourths of ſilver; is malleable; may be cut like lead; is white, green, yellow and lead-coloured; ſometimes of a regular hexagonal, priſmatic, cubic or octoëdral ſhape, or granulated, lamellated and like branches; ſometimes there is ſome arſenic mixed in this ore, which makes it very brittle.

b HORN-SILVER, OF HORNY-SILVER *(Luna cornua)* is a rich ſilver-ore, containing commonly two thirds of ſilver and one third of ſulphur, mixed with ſome few arſenical parts; is malleable; ſemidiaphanous; of a lighter or darker yellow browniſh colour; of a lamellated texture, like horn; brittle; not heavy; melts very eaſily in fire, and burns with a blue flame.

c RED-GILDER-ORES are rich ſilver-ores, containing commonly two-thirds of ſilver and one-third of arſenic, mixed with a few ſulphureous and irony particles; they are not malleable; ſome of them are ſemidiaphanous; of a fine lively red and of an hexagonal priſmatic ſhape; others are opaque, of a dull purple red and without any regular ſhape: they melt very readily, by a moderate degree of fire, with an arſenical ſmoak; crack when put into the flame of a candle, and are heavy.

d WHITE-GILDER-ORES are ſilver-ores, containing from fourteen to thirty marcs of ſilver in a hundred weight of ore, the reſt being ſulphur, a little arſenic, and a good deal copper; as the copper increaſes, the ſilver decreaſes, till at laſt it is called *white* or *fallow copper glaſs-ore*; the white-gilder-ore is of a white or light grey colour, glittering, heavy, brittle, and of an irregular ſhape.

e SOOT-ORE is a very rich ſilver-ore, in the ſhape of a black and ſoft powder, like ſoot; is found in the crevices of the rocks, and ſometimes in ſmall parcels; it is ſuppoſed to be a mouldered, rich white-gilder-ore; it yields ſometimes more than a hundred marcs of ſilver in a hundred weight of ore.

f GOOSE-DUNG-ORE is a rich ſilver-ore, of a looſe texture, conſiſting of particles of native and mineralized ſilver, mixed with ſpar and marle; it is ſometimes brown and yellow, ſometimes grey and green, and very like gooſe-dung.

g SILVER-YELLOW or SILVER-GILBE is a looſe yellowiſh ſilver-ore.

h SILVER-BROWN is a looſe brown ſilver-ore.

i SILVER-BLACK is a looſe black ſilver-ore.

k SILVER-MARLE is a marle of a white colour, containing ſome particles of native ſilver, or of mouldered ſilver.

l SILVER-CLAY is a blue or grey clay, containing ſome particles of native ſilver, which ſometimes have the ſhape of wings of flies.

GENUS III. COPPER (*Cuprum, Venus*)

COPPER is the firſt baſe metal; in weight ductility and toughneſs it is next to ſilver; its elaſticity is leſs than that of iron, but ſurpaſſes all the other metals; its ſonorousneſs is the greateſt; it is of a deep-red ſplendent colour; and ſoluble in all ſaline liquors and even in water, but it melts very difficultly.

Copper is found *native, ſolved in fluids* and *mineralized* with iron, ſulphur and arſenic.

1 NATIVE COPPER, VIRGIN COPPER, is to be met with under various ſhapes, as like hair, grapes, branches, flakes, grains, regular cryſtalline figures; fixed to ſpars, quartzs, flints, ſlates, ſandſtones; filling crevices of mountains, in large maſſes, or fixed to other copper-ores, miſpickel and arſenic-ſtones; ſometimes it is mixed in the ſand of rivers, and then waſhed out and called *waſh-copper* or *lavatories copper*.

2 PRECIPITATED or CEMENTED COPPER is copper diſſolved in an acid, eſpecially the vitriolic, and afterwards precipitated, by the great quantity and richneſs of the ſolution; or by help of iron put into the ſolution (in which caſe the acid, by elective attraction, diſſolves the iron, and depoſites in its ſtead particles of copper); or precipitated upon ſtone, earth and wood.

3 MINERALIZED or COPPER-ORE.

a VITREOUS COPPER-ORES, or COPPER-GLASS-ORES.

α RED-COPPER-GLASS-ORE is a copper-ore, containing from fifty fiſty to eighty pounds of copper, in a hundred weight of ore, the reſt conſiſting of a little iron, ſulphur, and arſenic; is heavy; of a violet blue colour, with a reddiſh and ſteel like caſt; not very hard, and almoſt malleable.

β Fallow-copper-glass-ore is a copper-ore, which is very near to the precedent, except that it is more brittle; it is the ſame with the *white-gilder-ore*, except that the proportion of ſilver is ſo much decreaſed, that the copper in its mixture prevails.

γ Black-copper-glass-ore, is a copper-ore of the ſame nature with the two preceding; ſometimes it contains more than a half of its weight of pure copper; it is of a dark grey colour; and has a vitreous appearance, when it is broken.

b Blue copper-ores.

α Azure-copper-ore is a rich copper-ore which beſides a great deal of copper, contains leſs iron, arſenic, and ſulphur, than all the other ores; it is of the fineſt ſky blue-colour, neither hard nor heavy; when it is broken, it looks like fine blue glaſs; and yields without much trouble, a great deal of very good copper.

β Lapis lazuli *(Sapphirus antiquorum)* is a fine blue copper-ore, ſpeckled with grains of pyrites, is very ſolid and admits a fine poliſh.

γ Mountain-blue is a fine ſky blue copper-ockre, or an ochraceous clay; and has particles of mouldered copper-ore mixed with a fine ſoft clay.

c Green copper-ores.

α Malachites or satin-ore is a ſolid copper-ore yielding ten or fifteen pounds of copper in a hundred weight; is formed by the concretion of a mouldered copper-ore, mixed with a ſpar like matter; therefore it is lammellated and ſtriated in its texture and takes a fine poliſh.

β Native verdegrease is a green copper-ockre, conſiſting of a looſe mouldered copper-ore.

γ Mountain green is a fine green copper-ockre, conſiſting of a mouldered copper-ore, mixed with ſome ſoft and fine earthy particles.

d **Liver-ore** is a rich copper-ore conſiſting of a good deal of copper mixed with iron, of a yellow browniſh colour, but mixed with ſome green ſpots, which diſtinguiſh them from the iron-ores.

e **White copper-ore** is a rich and very ſcarce copper-ore of a conſiderable ſolidity, and whitened by the great quantity of arſenic mixed with it; but diſtinguiſhed from the white arſenical pyrites by a more yellow colour, greater heavineſs, and ſmoother texture, when it is broken.

f **Pitch-ore** is a ſhining vitrified copper-ore, of a black colour like pitch.

g **Copper-pyrites, or copper-mundick** is a ſolid, yellow, and greeniſh pyrites, containing copper, a good deal of iron, ſulphur and arſenic; of a granulated, ſtriated or lamellated ſtructure.

h **Copper-mulm** is a ſoft looſe ochraceous copper-ore; of a grey, yellow, or brown colour,

i **Copper-nickel** is an arſenical ore, containing ſome few particles of copper mixed with arſenic, ſulphur and a cobalt earth, it melts with great difficulty.

Note, *Copper when extracted from the ores, after the firſt fuſion is called* black-copper *or a* pig of copper, *or a* ſalmon; *after another fuſion* roſe copper *or* regulus, *and at laſt* red-copper *or* fine-copper.

GENUS IV. IRON. *(Ferrum, Mars)*

Iron is the ſecond baſe metal, in weight it is to be ranked after copper; its toughneſs is next to that of gold; its ductility is leſs than that of copper; in elaſticity it ſurpaſſes all other metals; in ſonorouſneſs it follows after copper; it is of a blueiſh or grey ſplendent colour; ſoluble in all acids, ſaline liquors, and even in water and air; and has a great affinity with the magnet, which attracts it, and is attracted by it.

Iron is to be found *native* and *mineralized* eſpecially with ſulphur.

1 **Native iron** is to be met with in large maſſes and whole ſolid

rocks, or in grains; and is malleable, without any additional operation. *Grains* of native iron found in the mines in Saltzburg, Eiffel, and in the mountains of Sileſia, are malleable; *rocks* of native iron are mentioned by Mr. Adanſon, to be on the banks of the river Senegal. Mr. Marggraf from Berlin found in the iron-works at Eybenſtock in Saxony, a large maſs of native iron growing out of a ſolid iron-ore, laying between its two *ſalbands*.

Note. *All the ores fill up clefts in rocks, which are ſometimes very large, ſometimes ſmall; that part of the ore, which touches the other ſtone, beyond the cleft is always covered with a kind of coating, and this they call in Germany* the ſalband.

2 **Mineralized iron** is of two kinds, that which yields the *pig* or *ſow-iron* by its fuſion and is called *iron-ore*; that which is refractory, not worth melting by itſelf, is called *iron-ſtone*.

a **Iron-ore.**

α **Crystalline iron-ores** are ſmall ſtriated cubes and octoëdra of a dark, brown, or ruſty colour; and yield all good iron; however they are not attracted by the magnet; and are not malleable.

β **Common-iron-ore** has no certain figure; is of a reddiſh, brown colour, ſometimes blackiſh; it is not very heavy and yields very readily good iron; the quantity and goodneſs of which increaſes with the darkneſs of the colour and weight of the ore; it is ſometimes ſolid, ſometimes in grains, flakes, and ſmall cubes and ſcales; and it is attracted by the magnet.

γ **Blueish iron-ore** is of a brown-red and ſome what blue colour when broken; is very hard and ponderous; ſometimes ſolid, ſometimes in grains, ſmall cubes, flakes and ſcales; melts very readily and yields from ſixty to eighty pounds of iron in a hundred weight by the firſt fuſion.

δ **White iron-ore or steel-ore** is a white, yellowiſh, or Iſabella-coloured ore; ſometimes it is found in branches, ſometimes like ſugar-candy, ſometimes flaky, lamellated, ſtriated and rhomboidal, like ſpar, or like white garnets; it yields from thirty to ſixty and even to ninety pounds of the beſt iron; and is not attracted by the magnet.

ε **Blood stone, hæmatites, glass-head** is a dark red, extremely hard and heavy ore, which has one ſmooth, globoſe, convex ſide with boſſes upon it: the other part is compoſed of convergent ſtreaks, yields eighty pounds of the pureſt iron mixed with ſome little arſenic; the iron melted therefrom is white, brittle, and very ſeldom malleable; and is not attracted by the magnet.

ε Mirror-ore is black, ſplendid, ſmooth, and ſhining, like a mirror; is often ſtriated like the blood-ſtone, ſometime lamellated, flaky, writhed, or like ſlates; yields a good quantity of iron; and is attracted by the magnet,

ζ Magnet *or* load-stone is a blackiſh, grey or brown-red ore, of no determinate ſhape; however it is ſometimes of a ſolid, granulated or ſpeckly texture; yields ſometimes a conſiderable quantity of very good iron; attracts all iron and magnets, and one of its poles inclines always towards the north.

η Ockres, iron-ockres are deſtroyed and mouldered iron-ores, which are ſometimes mixed with marle, clay, or bole; they are of different colours, from pale yellow, to high brown-red, appear ſometimes in the ſhape of cruſts and are cavernous, as the brush-ore; ſometimes they are ſolid, as the red-lead, or ruddle; ſometimes quite diſſolved into a kind of earth.

ϑ Iron-sand is a blackiſh, brown, reddiſh, or various coloured ſand, conſiſting of ſmall particles of iron-ore; is attracted by the magnet; and yields a good deal of iron.

b Iron-stones.

α Emery is a poor grey or browniſh, extremely hard ſtone, but not ſo hard as the blood-ſtone, and is very refractory in melting.

β Magnesia, manganese, brown-stone is a grey or dark brown, dirty ore; of a ſtriated, ſcaly or cubic texture; which melted yields a ſmall quantity of brittle and friable metal.

γ Iron-glimmer, eisenman is a ſtriated; ſhining, dark grey, arſenical refractory ore.

Wolfs-scum, wolf-ram is a dark brown, reddiſh, ſtriated,

ted, cubic, ſcaly, ſometimes ſemidiaphanous, arſenical refractary ore, which ſcraped produces a dull-red colour.

c IRON is beſides to be met with in many other ores, *viz.*

α YELLOW SOLID PYRITES,
β PYRITEOUS NODULES.
γ MARCASITES.
δ ARSENIC-STONE.
ε ZINC-ORE.
ς YELLOW AND RED CALAMINE BLEND.
ζ IN THE VARIOUS COPPER-ORES.
η TIN-GARNETS, and TIN-STONES.
θ And in the SILVER-ORES, *viz.* red-gilder-ore, &c.

GENUS V. TIN (*Stannum, Jupiter*)

TIN is the third baſe metal; it has the leaſt ſpecific gravity of all the metals; its toughneſs is greater than that of lead, but inferior to that of copper; its ductility is next to that of iron; when pure, it has no ſound at all, but it increaſes the ſonorouſneſs of all metals, when mixed with them, or when ſome ſemimetal is mixed with the tin; in elaſticity it is ranged after gold; it is of a white, grey, ſplendent colour, like ſilver. It is corroded by all the ſaline acids, but not ſolved; aqua regis acts the moſt upon it; it melts, before it comes to be red-hot, by a moderate degree of fire.

Tin is to be found *native* and *mineralized* with iron and arſenic.

1 NATIVE TIN, WHITE TIN. It has been doubted for a long time, whether tin has been found native; however ſome mineralogiſts have mentioned it: but very lately a ſpecimen of it has been diſcovered in Cornwall and preſented to the Royal Society, ſo that it is now an undeniable fact; it is found joined to an arſenical-ore, which could not be done by art, without the application of fire; in which caſe the arſenic would have been volatilized; and this is alſo a proof of its being *true native tin*.

2 TIN-ORES OF MINERALIZED TIN.

a CORN-TIN, TIN CRYSTALS, TIN-GRAUPES are opaque, polyëdrous cryſtals, with diſſimilar faces, a gloſſy ſurface, and truncated angles, containing, beſides a good deal of tin, one third or one half of arſenical particles, which appear white, like flour upon the ſurface of theſe cryſtals, by their uſtulation, and ſome brittle iron. Theſe cryſtals are very heavy; of a white, pale yellow, reddiſh, brown or black colour; the darker they are, the more tin they contain. They all melt very difficultly, and require a great deal of fire. That kind of *corn-tin*, which has ſmall grains, is called ZILL-TIN.

b TIN-STONE, MINE-TIN, TIN-ZWITTER, i. e. TIN-MONGREL is an heavy ſolid tin-ore of a yellowiſh, red, brown, black, and variegated colour; containing about two thirds of tin, the reſt being iron, arſenic, (which makes this ore ſo heavy) and a fine vitreſcible earth; it is compoſed of ſmall tin-grains, which ſometimes are viſible, ſometimes inviſible to the naked eye; the ſtructure of the tin-ſtone, is ſometimes porous, or ſtriated, or granulated. The tin-ſtone is pounded and the *black-tin* or the metallic parts ſeparated, from the uſeleſs parts, called *cauſalty*, by waſhing.

c PRYAN-TIN is a tin-ore mixed with a ſmall gravelly earth, of a white or red colour, and is ſcarcely half the value of the tin-ſtone.

d GARNETS, although they are reckoned under the gems, contain however ſometimes ſome ſmall matter of tin, and may therefore be reckoned under the tin-ores.

GENUS VI. LEAD. (*Plumbum, Saturnus*)

LEAD is the fourth baſe metal; it is the next in weight to gold; its toughneſs, ductility, elaſticity, and ſonorouſneſs are the leaſt of all metals; it is the ſofteſt of all; it melts before it is red-hot, and then partly flies off in ſmoak, partly turns into cinders, vitrified ſcoriæ, and litharge; it is of a whitiſh-blue, livid colour; ſoluble in aqua fortis, ſpirit of nitre, acid of vitriol, aqua regis, vinegar; in fixed alkali, when boiled or melted, in urinous ſalts, and when reduced into white or red-lead, it is ſoluble in boiling oil of turpentine, and all the expreſſed oils.

LEAD is found *native* and *mineralized* with ſulphur, arſenic and ſilver.

1 NATIVE LEAD is found very ſeldom, but however it is ſometimes met with in a ſolid maſs, and in grains like ſhot.

2 MINERALIZED or LEAD-ORE.

a CUBIC LEAD-ORE, LEAD-GLANCE is a teſſelated, ponderous lead-ore, compoſed of larger or ſmaller cubes, which again conſiſt of ſmall ſlates of a blueiſh black colour and very gloſſy; it contains commonly ſixty five, ſeventy or ſeventy five pounds of lead in a hundred weight, the reſt being ſulphur, with ſome ſmall matter of ſilver; ſome of theſe ores are radiated and of very ſmall grains, which are called LEAD-TRAIL or *bleyſhweiſ*, and contain, beſides the ſulphur, ſome parts of iron and arſenic. POTTERS-ORE, STEEL-ORE, FRIM-ORE, and SOFT-ORE are varieties of lead-glance.

b LEAD-SPAR is a ſemiopaque lead-ore, of a priſmatic hexagonal greeniſh colour; of a lamellated ſtructure; contains from ſixty upwards to eighty pounds of lead in a hundred weight of ore.

c LEAD-CRYSTALS form a diaphanous lead-ore, of a priſmatic, hexagonal ſtructure; they are very heavy and of a white, yellow green and red colour; are compoſed of lead, ſpar, arſenical and ſome ſulphureous parts.

d LEAD-STONE is a ſmall lead-glance, almoſt inviſible to the naked eye, like ſpeckles in ſtone eſpecially of the marle kind; of a white, grey, blue, brown or blackiſh colour; and yields ten or twelve pounds of lead in a hundred weight.

e LEAD-EARTH is a clay, or marle, impregnated with ſome ſmall dark grey lead-glance, of a white, yellow or red colour; and yields from twelve to twenty pounds in a hundred weight.

Beſides theſe ores, LEAD is in ſmall quantities, in

f CALAMINE-ORE

g RED CALAMINE BLEND.

SERIES II. SEMI-METALS. (*Semi-metalla*)

SEMIMETALS, are fluid and ſolid; the only fluid ſemimetal is *quick-ſilver*; the ſolid ſemimetals are *tin*, *biſmuth*, *antimony*, and *cobalt*.

FLUID SEMIMETAL.

GENUS I. QUICKSILVER MERCURY (*Argentum vivum, Hydrargyrum, Mercurius*)

QUICKSILVER is a ſemi-metal, which continues fluid, in the moſt intenſe freezing, either natural or artificial, or when both are combined; it is without coheſion; the leaſt power will divide it into an infinite number of globules; it is opaque; of a white, ſplendent colour, like ſilver; extremely volatile in the fire; cannot be calcined, nor vitrified; attracts and diſſolves all the metals, except iron, antimony and cobalt; its combination, with either of theſe is called *amalgam*. Quickſilver is ſoluble in the acids of ſalt, ſaltpetre, vitriol, and aqua regis; with ſulphur it conſtitutes a new ſtriated or lamellated body, called *Cinnabar*.

Note. *According to Counſellor Lehmann's obſervation, the mercury employed by profeſſor Braun in his experiments was diſtilled in the common way through water, and the water only was frozen, and not the mercury itſelf: but having employed mercury diſtilled without water and carefully purified from all watery particles, the mercury would not congeal although common mercury did freeze, when ſet in ſnow mixed with ſpirit of nitre or ſpirit of ſal ammoniac.*

Quick-ſilver is found *native*, and *mineralized* with ſulphur.

1 NATIVE QUICK-SILVER is pure quick-ſilver, which is found in the mines in maſſes or collections or mixed with other bodies.

a VIRGIN-QUICK-SILVER is pure quick-ſilver, quite fluid, without any additional parts, and found in cavities in clay or quartz.

b QUICK-SILVER-EARTH is quick-ſilver mixed with a calcareous earth or clay of a white or red colour; is often not fluid.

c QUICK-SILVER-STONE is quick-ſilver mixed with an earth or ſtone ſo as to make up a ſolid maſs, without the leaſt appearance of quick-ſilver; it is commonly of a red-brown colour and yields three fourths of pure quick-ſilver.

2 QUICK-SILVER-ORE, OF MINERALIZED QUICK-SILVER; CINNABAR, NATIVE CINNABAR, VERMILLION, CINNABAR-ORE, GROWN CINNABAR is a bright or dark red, heavy, ſtriated quick-

ſilver-ore it contains ſix eights or ſeven eights of quick-ſilver with two eights, or one eight of ſulphur; is ſometimes found in large maſſes, ſometimes in ſtones, as calcareous ſtone, ſpar and quartz; or in other ores, as mundicks, and copper-ores.

SOLID SEMIMETALS.

GENUS II. ZINC. (*Zincum*)

ZINC, SPELTER CALAMINE is a ſolid ſemimetal in ductility the next to the metals; of a white, blueiſh, livid colour; when broken, it appears fibrous, or cubic; melts readily, is very volatile and imparts this quality to all the other metals, excepting gold; burns with a green flame; is ſoluble in all acids, mineral and vegetable; and its filings are attracted by the magnet.

Zinc is mineralized with ſulphur, arſenic, lead, iron and copper.

1 ZINC-ORE is a dull, dirty ore, containing ſulphur, iron, lead-glance and zinc, of a whitiſh, blueiſh, brown or iron-coloured appearance.

2 CALAMINE, CALAMINE-STONE is an ore, of a looſe or ſometimes, compact texture of a yellow, brown or reddiſh colour, when melted with copper, makes braſs; and its flame is blueiſh.

a CALAMINE-EARTH is an earthy ſubſtance, of a yellowiſh colour, and ſeems to be a mouldered zinc-ore.

b CALAMINE-STONE is of a ſtony ſubſtance and of a yellow-brown colour.

c CALAMINE CRYSTALS are fine yellow cryſtals, ſticking to the calamine-ore, towards the ſide, where they are joined to the common earth or ſtone.

3 CALAMINE-BLEND is an heavy, ſcaly, lamellated, or teſſelated ſplendent zinc with ſulphur and arſenic, and ſome parts of iron and a refractary earth; it is of a yellow, red or black colour. One yellow kind of it is found ſemidiaphanous: the red kind ſhines when heated in the dark like a *phoſphorus*: BLACK-JACK is a variety of this calamine blend.

4 ZINC-VITRIOL, OF WHITE VITRIOL, and

5 WATER *impregnated with* WHITE VITRIOL both contain zinc.

GENUS

GENUS III. BISMUTH (*Wiſmuthum, Biſmuthum, Stannum cinereum*)

BISMUTH, TIN-GLASS is of leſs coherency than zinc; its texture appears to be lamellated cubes, of a duſky yellowiſh, ſomewhat red colour; which when expoſed to the air for a conſiderable time, turns into changeable ſtreaks; it melts very readily and facilitates the fuſion of ſuch metals as do not; is volatile; ſoluble in acid of vitriol and ſalt, but in acid of nitre it yields a roſe-coloured and in aqua regis an orange ſolution; it communicates to lead the quality of amalgamating with mercury ſo perfectly, as to paſs with it, through ſhamoy leather without any ſeparation.

Biſmuth, like gold, is always found native, but ſometimes this ſemimetal is ſo ſurrounded with cobalt, tin, arſenical and ſulphureous parts, that it does not appear to the naked eye, and this is improperly called *biſmuth-ore*, being never mineralized with theſe foreign bodies. Biſmuth breaks always in mines of cobalt and tin, in ſpar, horn-ſtone, and quartz, very ſeldom in ſlates.

1 **NATIVE BISMUTH** is found ſolid or in grains, flakes, and cubes mixed with other ores or ſtones, and it is diſcoverable by its flowing with the heat of a candle and by yielding a red ſolution in the acid of nitre.

2 **BISMUTH-ORE** is of a white greyiſh colour; a granulated, teſſelated ſometimes ſtriated texture; and contains biſmuth, arſenic, and cobalt,

3 **BISMUTH-FLOWERS** are parts of biſmuth, ſulphur, arſenic, and cobalt, attached in a conſiderable thickneſs to other ores and ſtones; they are of a red, green, blue or commonly a duſky yellow colour.

GENUS IV. ANTIMONY (*Antimonium ſ. Stibium*)

ANTIMONY OR REGULUS OF ANTIMONY is of ſtill leſs coherency than the two preceding ſemimetals; its texture is fibrous and ſtriated; of a white bright, ſplendent colour; it flows very difficultly, diſſipates very readily into ſmoak and white vapours, and imparts its volatility to other metals; it is partly ſoluble in acid of vitriol and nitre, but entirely in ſpirit of ſalt and in aqua regis. Its metallic part mixes with gold, and the ſulphureous with all the other metals; it deſtroys magnetiſm, and diſables iron from being attracted by the load-ſtone.

Antimony is found *native*, in its pure and reguline ſtate; but commonly *mineralized* with ſulphur and ſometimes with arſenic.

1 NATIVE ANTIMONY was found about twenty years ago in Sweden, in its reguline ſtate.

2 ANTIMONIAL-ORE.

a STRIATED ANTIMONIAL-ORE is of a grey blue ſplendent colour; is brittle and contains three fourths of antimony and one fourth of ſulphur; it is of a ſtriated ſcaly texture, or like feathers, and it melts, on account of the mixture of ſulphur in it, very readily.

b SOLID ANTIMONIAL-ORE is not eaſily diſtinguiſhed from the iron-glimmer, brown-ſtone, wolfs-ſcum, calamine-blend, and ſmall cubic lead glance, except by the eaſe with which it melts, which is peculiar to the antimonial-ore.

c CRYSTALLINE ANTIMONIAL-ORE is of a grey blue colour, on the inſide ſtriated, which gives it the appearance of cryſtals.

d PURPLE-ANTIMONIAL-ORE is finely ſtriated; is of a beautiful purple red colour, and contains beſides the antimony and ſulphur, ſome arſenic.

GENUS V. COBALT. (*Cobaltum, Cadmia foſſilis metallica*)

COBALT is of the leaſt coherency among the ſemimetals, of a ſtriated, flaky ſometimes granulated and earthy texture; heavy, hard but brittle; and when broken it has the reſemblance of a broken metal; it is of a pale grey colour, with a yellowiſh caſt; melts only in a great degree of fire; is ſoluble in the vitriolic acid, which attracts from it the tinging matter which ſhoots into red cryſtals or *vitriol of cobalt*; the ſpirit of ſalt diſſolves it; the nitrous acid diſſolves it in part, and gives a green ſolution; in aqua regis the ſolution is likewiſe green; the precipitate of its ſolution in ſpirit of nitre and aqua regis, made by a mineral fixed alkali, is black; by a volatile alkali, is red; borax precipitates likewiſe the ſolution of cobalt. It is by no means miſcible with biſmuth. The calx of cobalt tinges glaſs with a fine blue violet colour.

Cobalt is never found native, but only *mineralized* with arſenic.

1 COBALT-ORE is a grey duſky coloured ore, ſolid, granulated, flaky, or cryſtalline; it contains arſenic and cobalt.

2 COBALT-SLAG is of a blue greyiſh, ſplendent colour, ſimilar to metallic ſcoria or droſs, contains cobalt and arſenic.

3 COBALT-FLOWERS are of the colour of peach-bloſſoms, ſtriated and fibrous, and contain arſenic, cobalt, and ſometimes biſmuth.

4 COBALT-EARTH is an earth impregnated with particles of cobalt, ſometimes white, yellow, or blackiſh,

5 COPPER-NICKEL is a reddiſh grey ſplendent ore, containing cobalt, arſenic, copper and ſomewhat of ſulphur, *ſee the copper-ores.*

Beſides theſe cobalt-ores there are two other ſubſtances, which contain no arſenic, will not yield a regulus, and however tinge a mixture of ſand and alkali with a fine blue.

a THE BLACK COBALT, which is a kind of calcareous ſpar, black, dirty, without the leaſt mark of arſenic, yields by no means a regulus, is diſſolved in all acids; fixed alkali precipitates again this black cobalt in its ſolution; the vitriolic acid precipitates a part of it, and forms a ſelenites; and it detaches a part of the urinous particles from the ſal ammoniac,

b THE BLACK-HORNY-COBALT is a black, hard, vitreſcible horn-ſtone; ſtrikes fire with ſteel; yields neither arſenic, nor regulus of cobalt; and when melted with fixed alkali, turns into a fine blue glaſs.

A
DISCOURSE
ON THE
GENERATION OF MINERAL BODIES.

CHAP. I.

Diviſion of Mineral Bodies.

MINERALS *in general* are generated by an aggregation of their integrant parts, which appears from the different foreign bodies found in their interior parts; as bones of quadrupeds and birds found at a great depth, ſubmarine productions incloſed in foſſils upon high Mountains, at a great diſtance from the ocean; plants in the different ſtrata of ſtones; tools found in the quarries of marbles, &c. Theſe inſtances ſhew moreover, that theſe ſubſtances were formerly in a ſoft ſtate; as it is impoſſible for bones, ſhells, plants, tools, &c. to get into ſuch hard maſſes as they are often found in.

From chemical experiments it appears, that the integrant parts of mineral bodies, may be reduced to a few *homogeneous principles*, which cannot be reduced any further by human art,

Theſe *principles* are, according to the moſt celebrated and ſkilfull mineralogiſts, an *earthy*, an *inflammable*, and a *mercurial principle*.

The combination of theſe principles forms the different mineral bodies. The different qualities and relations of theſe principles in regard to their fineneſs and ſubtilty, the different weight and proportion of theſe principles in the reſpective maſſes and the different ways by which they are united, are the cauſes of the varieties, which are obſerved in mineral bodies.

Mineral bodies in general are but of four kinds; *earthy*, *ſaline*, *inflammable*, and *metallic*.

All the *earthy bodies*, that is, thoſe which are yet in a ſoft and looſely coherent ſtate; or thoſe which are in an indurated and more coherent ſtate, that is, *earths* and *ſtones*, are all called by mineralogiſts *foſſils*.

Minerals in ſpecie are ſuch bodies, as are compounded of all the four above-mentioned kinds, or of ſome of them; ſo that the proportion of the ſaline, inflammable, or metallic parts is perceptible.

Metals are the moſt ſolid, denſe, ſonorous, heavy, opaque, fuſible bodies, congealing in a convex reguline ſurface.

Earth when perfectly pure is abſorbent, hard, dry, and diviſible: colour, coheſion, weight, effervefcence, vitreſcibility, and other qualities are adventitious.

Saline bodies are generated by the mixture of earthy and watery particles, mixed with an inflammable principle, which appears from their fuſibility.

Inflammables are produced by the combination of ſome earthy particles, intimately united to ſome oily, and ſome acid particles.

Metallic ſubſtances are compounded of a fine vitreſcent earth, an inflammable principle, and the mercurial principle, which is very heavy, but exceedingly ſubtle and volatile, penetrating through all other ſubſtances.

The four laſt mentioned ſubſtances are not found in nature quite pure, but have always in their compoſition ſome parts of the other claſſes. The denomination however is always taken from the moſt prevailing ſubſtance.

CHAP. II.

General account of the ſtructure of the ſurface of our globe and its ſtrata.

Plains make up the common ſurface of our globe; *mountains* are eminences on it: ſome of them conſiſt of ſtones, ſome of earthy parts, and owe their generation partly to the original conſtitution of this globe, and partly to the various changes either general or particular, which it hath from time to time undergone. The plains ſeldom contain other things but earth, and ſome few poorer ores of the baſe metals, ſemimetals, and inflammables: both kinds of mountains, on the contrary, are the chief ſeat of minerals and metals.

The Original or *Primogenial mountains* conſiſt throughout of a uniform maſs of rock-ſtones, apyrous ſtones, ſpars, ſome calcareous ſtones, and ſome of the vitreſcent kind. *The Latter* or *Secondary mountains* owe their exiſtence to volcanos, earthquakes, irruptions of the ſea, receſſions of the ocean and other cauſes, perhaps principally the *Noachic* deluge. The above-mentioned changes have formed all thoſe mountains and ſtones, whoſe ſtrata run horizontally; theſe are the different ſlates, ſome calcareous and gypſeous ſtones and ſome ſpecies of the vitreſcent kind; all which however bear but a ſmall proportion to the ſtones in general.

Petrefactions are commonly found in the ſecondary mountains, and never in the original ones, excepting ſome caverns filled with a dripping-ſtone: ſometimes indeed they are found in the lower and external parts thereof; but never in the middle of the primogenial mountains.

This difference in the mountains makes likewiſe a very eſſential difference in the minerals contained in them. The original mountains yield the moſt valuable minerals and ores, produced in the way, which they call *gang-work*; the ſecondary mountains have, on the contrary, nothing but *flat-work*, containing ſmall quantities of poor minerals and ores.

Gang-work is a crevice or cleft, croſſing the mountains at right angles or nearly, running along the direction of the mountains, and is filled up with foſſils and minerals different from the native ſtones of the mountains themſelves.

Flat-work on the contrary is a ſtratum of foſſils and minerals lying in a horizontal poſition, or having few degrees of obliquity.

One peculiar kind of gang-work is a very large cleft, beginning at the top and extending, though often irregularly, in the ſhape of a wedge, to the bottom, and penetrating to a conſiderable depth in the mountains, this is called in Germany *ſtock-work*.

When the ſtrata of gang-work and other foſſils are, as it were, thrown alternately one above another; and the ſtone changes, the mineral becoming richer and the cleft larger, they call it *geſhutte*, from its being *thrown*.

When in a common gang-work a part grows richer without enlarging the cleſt, and as it goes further diminiſhes again in richneſs, it is called a *neſt*. Theſe are all to be met with in mountains.

Single and detached pieces of minerals are often found in plains, valleys, and in the beds of rivers; theſe they call *geſchube*, i. e, *dragged,* becauſe they are accidentaly dragged there by currents of water, or ſome eruptions from the mountains and are never generated in ſuch places.

CHAP. III.

General account of the powers and operations by which the generation of mineral bodies may be effected.

All foſſils, minerals and metals are generated by combination: *combination* depends upon the *attraction* of the *diſcrete* parts, or the *ſeparation* of the *concrete* parts, neither of which can be effected without previous *fluidity*; and this is impoſſible without *ſolution*, *exhalation* or *fuſion*; the firſt is produced by *air* or *water*, the ſecond by *air* or *fire*, the laſt by *fire* only.

All *ſolutions* ſuppoſe a certain relation of the *ſolvend* to the *ſolvent* or *menſtruum*; that is, the ſolvend, muſt be entirely or in ſome degree homogeneous to the menſtruum; or ſome of its component parts muſt have an elective attraction with it: the texture of the ſolvend muſt be ſuch as will allow the menſtruum to pervade it: the weight of the ſolvend muſt be in due proportion to that of the menſtruum: and the acceſſion of freſh air, with a proper degree of heat, is neceſſary to make the ſolution ſucceed.

Fuſion is a ſolution of the component parts of a body expoſed to the action of fire. *Fire* exerts its power by a quick and elaſtic motion of fine, acid, and totally unfolded particles; theſe inſinuate themſelves into the homogeneous, acid parts of the fuſible body, and by dividing the earthy parts very minutely, bring the fineſt fixed parts into a nearer contact: the other leſs ſubtle parts ſometimes remain untouched, and on account of the coarſeneſs of their texture have fewer points of contact: the former being the heavier, are ſolved and are found at the bottom of the veſſel, and called, when opaque, a *regulus*; or when tranſparent a *glaſs*; the latter being of leſs gravity ſwim on the ſurface, are porous, and are called *ſlag* or *ſcoriæ*.

A leſs degree of fire gently diſſolves the acids, and by this means the moſt volatile and fine particles are carried off by *exhalation*; if the expelled parts be from fluid bodies, the operation is either an *evaporation*, and the remainder is *inſpiſſated*, for obtaining the fixed parts; or a *diſtillation* for obtaining the volatile parts. In caſe the parts expoſed to exhalation be ſolid, by gentle fire, it is *uſtulation*; by a more intenſe fire, capable of deſtroying its coheſion, it is *calcination*[*]; if the volatile parts are to be preſerved, it is *ſublimation*; if the volatile parts of one body be intended to pervade an other, it is *cementation.*

Air is of two kinds, *mephitic* and *common*; both are neceſſary to the generation of foſſils, minerals and eſpecially metals.

That there is in ſubterraneous places ſuch a ſpecies of *denſe mephitic air*, capable of bearing the fineſt particles of inflammables and metallic principles ſwimming in it, no body can deny, who knows the nature and effects of ſubterraneous vapours; which very often give a vehement exploſion, when they take fire by a candle in the mines to the great danger of the miners: theſe vapours when charged with arſenical and noxious efluvia often deſtroy the workmen or at leaſt hinder them from purſuing their buſineſs till the vapours are removed.

Mephitic air anſwers a double purpoſe: it is one of the cauſes of the coheſion of bodies, eſpecially of metallic ſubſtances; ſecondly on account of its denſity it is able to contain, ſwimming as it were in itſelf, the finer parts of fluids, acids, inflammables and metallic ſubſtances, when they are detached and riſen like vapours in ſubterraneous incloſed clefts and to carry them through ſuch foſſils and other bodies, as are lax and porous enough to let them paſs.

The acceſſion of *common air* congeals and hardens the wet and ſoft mixtures under ground; precipitates the particles ſwimming in the mephitic air, into hard maſſes; and diſſolves the texture of many foſſils, minerals and metals, ſo that other mixtures may be formed from theſe ſolutions.

Water is certainly to be met with in great quantities under ground; every one, who has the leaſt notion of mines, muſt be acquainted with the trouble occaſioned by the great quantity of ſubterraneous water; and with what great expence, and many ingenious contrivances they are obliged to diſcharge it. The water then paſſing by ſo many foſſils, ſalts and minerals, gradually diſſolves them and becomes impregnated with their finer particles, eſpecially with thoſe of the acids and alkalis, which it meets with in its paſſage; by which means it becomes a very good ſolvent of other bodies, eſpecially of metallic ſubſtances, when it paſſes near them. Such a ſolvent being thus changed into a ſolution of foſſils, ſalts, inflammables, and metals, and filtrating through a porous ſubſtance, depoſites theſe particles in the pores of the foſſil; or running into a cleft, precipitates the diſſolved parts, when they are too copious and heavy; or if the water be expelled by a gentle heat, the heavier diſſolved parts become inſpiſſated and gradually fill the cleft.

The exiſtence of a *ſubterraneous fire*, which however muſt be carefully diſtinguiſhed from the *culinary fire*; may very eaſily be demonſtrated to one, who is acquainted with the effects, which filings of ſteel mixed with ſulphur and water produces; and this will enable him to judge of the effects of ſuch a fermentation in ſubterraneous parts, where irony particles are in great plenty, and where large ſtreams are to be met with, which paſſing by ſulphureous ſtrata bring theſe matters together and give riſe to thoſe violent fermentations, which would certainly break out into flames, were it not that the communication of the external air is cut off. Large coal pits and aluminous earths ſet on fire by mere fermentation ſhew ſtill more clearly how eaſy it is to produce fire, or to cauſe at leaſt a vehement degree of heat under ground.

This *heat* acts upon the ſubterraneous acids, and by their means carries off the fluid, acid, inflammable and metallic principles, in the form of vapours, through thoſe foſſils, whoſe texture is ſufficiently open to admit them, till they met with a more denſe foſſil, which obliges them to depoſite their ſaline, inflammable and metallic parts in the pores and crevices of this denſer foſſil: or when theſe vapours get into a cleft of a mountain, they pervade it from one end to the other, till they are checked by the compacter ſtones, which commonly ſurround the cleft; or being driven againſt the walls of the cleft (which are cold, from the external air) the vapours congeal and depoſite theſe matters, which they carry along with them, till the whole cleft is filled up, with a new ſubſtance formed by the denſe vapours.

Theſe few previous remarks will enable us, to form ſome probable conjecture of the generation of mineral bodies in general, as far as it is in our power to inveſtigate the operations of nature.

CHAP.

Chap. IV.

Generation of ſtones.

Stones are undoubtedly maſſes of earth, which were formerly in a ſoft diſſolved ſtate and have been indurated by *elective attraction*, *cryſtallization*, or *evaporation*.

An abſorbent earth, mixed with a few acid and alcaline particles, diſſolved together in water, and afterwards evaporated by a gentle degree of heat, might form *calcareous ſtones*. The difference in theſe ſtones ariſes from the different proportions and weight, which theſe mixed bodies have to one another; the manner in which they are mixed and generated; and the ſubtilty of the integrant parts.

The more ſaline particles are in theſe mixtures, the more regular is their texture; as in *ſpars*.

The finer their integrant parts are and the more ſulphureous or bituminous and metallic parts enter the mixture, the more compact is their texture, and the more diverſified are their colours; as in *marbles*.

An abſorbent earth, mixed with ſome ſal ammoniac, a viſcid vegetable acid and water, makes a mixture, which coagulates into a hard ſubſtance, like *vitreſcent ſtones*. Or in general, an abſorbent earth ſaturated with ſaline particles, eſpecially of the alkaline kind, gives a mixture which is readily fuſible; and ſo we find that *quartz*, in a violent fire, yields a ſmall quantity of a volatile alkaline liquor. Theſe few inſtances give us ſome intimation how the *vitreſcent ſtones* may be generated.

The fineſt parts of ſuch a maſs, mixed with ſome metallic parts, and aggregated by lamellæ, might form thoſe ſtones which are called *gems*.

The leſs finer parts, when impregnated with ſaline and metallic parts, might yield *cryſtals*.

When coarſer particles of the ſame kind are mixed with ſaline particles, they might make *vitreſcent ſpars*.

The decreaſe of ſaline parts might make *quartzs*.

When a glutinous matter is united to the maſs, *flints* might congeal out of it; this laſt maſs might be different, according as the particles are more or leſs fine, and as various metallic particles are mixed with it, and might hence give the various colours of the *cor-*

nelians, *chalcedonys*, *onyx*, *agates*, and *jaſpers*. Coarſer particles mixed with ſome alkaline, acid, and inflammable parts, all diſſolved in water, by repeated inundations would depoſite this mixture and might produce *ſlates*.

An abſorbent earth, diſſolved in acids and precipitated with a vitriolic acid, forms the *gypſeous* or *ſelenitic ſtones*.

An abſorbent dry, gloſſy earth, is likewiſe the chief conſtituent part of the *apyrous ſtones*; but it is not yet diſcovered, to what theſe ſtones owe their regular and ſometimes ſhining texture, and the varieties obſerved among them.

CHAP. V.

Generation of Salts.

The generation of *ſalts* is owing to many operations as *ſolution*, *evaporation*, *elective attraction*, and *cryſtallization*.

The *ſalts* are found with water in a ſtate of ſolution; or ſolid.

Acids are not met with ſeparately, but are mixed in a great many ſubterraneous bodies: and indeed a kind of *univerſal acid* ſeems to be diſperſed through the whole extent of the atmoſphere: the acid, detached by heat and fire from the reſpective bodies containing it, riſes in vapours, and circulates every where, till it is checked by denſer ſubſtances, where mixing with aqueous vapours it forms a liquor, which becomes a menſtrum for many ſolutions, and a conſtituent part of many mixtures and compounds.

The *alkalis* are very ſeldom found native and ſolid: there are however inſtances of native mineral alkali: it is not very eaſy to account for their generation; let us however make ſome attempt this way. The baſis of a marine ſalt is a fixed alkali, which remains after the acid of the marine ſalt is ſeparated from it; this may happen in ſome ſuch manner as this: when ſea-water, together with a great quantity of marine and other animals, is left by an inundation in a cavity expoſed to the air, wind, rain, and great heat of the ſun; the dead marine ſubſtances go into putrefaction, and the muriatick ſalt itſelf, according to the obſervations of Boerhaave and other celebrated chymiſts, putrifies and becomes urinous; afterwards the volatile parts fly off by little and little, and leave behind a fixed ed *alkali*: this ſeems to be the caſe with the fixed alkalis in Perſia, near Aſtrachan, near Ochotſk, and in Egypt.

The metallic compound ſalts are without doubt nothing but evaporated ſolutions of copper, iron and zinc, made by the *vitriolic acid*. The vitriolic acid is ſo frequently found in the different pyrites and large ſtrata of coal, that a moderate degree of heat and moiſture would eaſily detach ſome particles of this acid and carry them in the form of vapours into clefts filled with copper, iron, and zinc-ores: a ſolution of theſe metallic bodies would by theſe means take place, and the metallic ſalts at laſt be left by way of evaporation: this is the more probable, as vitriolic cryſtals are found now and then in coal-pits and mines.

Arſenic ſeems to partake of a *muriatic* acid, ſaturated with the metallic parts of the regulus of arſenic: but as a ſufficient number of proper experiments have not yet been made to inveſtigate the nature of this mineral, it is very difficult if not impoſſible, to aſcertain the manner of its generation.

The generation of *neutral ſalts* is likewiſe difficult to be accounted for; however we may form ſome probable conjectures relative to it. We have already ſaid that marſhes and lakes filled with muriatic ſalt might produce by putrefaction a fixed alkali; which afterwards united to a vitriolic acid riſing in the form of vapours, or introduced by the flowing of rain water impregnated with its particles (having before paſſed by ſome mouldered ſulphureous pyrites) may be neutralized into a *ſal mirabile*.

The generation of *ſalt-petre* is as yet a myſtery in nature: we know that a fixed vegetable alkali mixed with the nitrous acid generates ſalt-petre; but the manner in which theſe things produce this effect is not yet diſcovered. The following is a well known practice. Long walls made of clay, ſtraw, mudd and putrified animal ſubſtances are erected; this maſs attracts from the air the *acidum catholicum* or *univerſal acid*, which is ſaid to be of the vitriolic kind; and therefore it is ſtill more a myſtery, how this maſs can change this acid into the nitrous one; and all that we can ſay is, that this is *dignus vindice nodus*. And as ſalt-petre is brought in ſo great plenty from the Eaſt-Indies a ſtrict examination of the manner uſed there by the natives to get this commodity in great quantities would perhaps throw ſome light upon the generation of this neutral ſalt.

The ſea furniſhes us with all the varieties of *muriatic* ſalt which we find in the ſubterraneous ſtrata in the form of *rock-ſalt*; or *lake-ſalt*; or *bay-ſalt*; or *fountain-ſalt*. When the brine loſes its water by evaporation, the ſalt ſhoots into cryſtals and obtains a different appellation according to the place from whence the ſalt is taken.

Sal ammoniac can only be generated by preſenting the muriatic brine to a volatile alkali: if therefore a muriatic brine ſhould happen to meet with a great quantity of animal bodies and they ſhould go into putrefaction, this might yield a kind of *ſal ammoniac*; a ſalt lake therefore full of fiſh, expoſed to a ſubterraneous moderate heat might form *native ſal ammoniac*.

A calcareous earth, diſſolved in an acid and precipitated again by the vitriolic acid forms cryſtals of a heavy earthy neutral ſalt, ſoluble only in boiling water. This will enable us to form an idea of the generation of *ſelenites*, which is always found in the neighbourhood of alum-works, pyritical ſtrata, coalpits, in the places where ſulphur is found native and wherever the ſulphureous or vitriolic acid meets with diſſolved calcareous earths.

All clays almoſt have more or leſs of an earth, which when impregnated with the vitriolic acid forms the *earth of alum*: ſometimes it is a clay mixed with calcareous parts, indurated to ſtone, which ſeems to be very much the nature of the *Roman alum*.

The generation of *borax* and the manner of refining it from *tinkal* are not yet aſcertained; which makes it the more difficult to give a ſatisfactory account of it; and it is to be wiſhed that thoſe who are well ſkilled in chemiſtry and natural hiſtory and have an opportunity of viſiting the Eaſt-Indies would give more attention to the natural hiſtory of *tinkal*, than hath been done hitherto; and inquire at the place from whence it is brought, if it be natural or artificial; if artificial, what conſtituent parts they employ in preparing it; but if natural, they ought to examine the ſoil, water, air, heat, place, and manner in which it is dug, and all the adjacent mineral bodies, which altogether might open a fair way to a more full diſcovery of the nature and properties of borax.

CHA

Chap. VI.

Generation of Inflammables.

The *inflammables* all contain the vitriolic acid, only with this difference, that in Naphtha, ambergreaſe, and yellow amberthis acid is intimately united to ſome fat or oily particles, from which it cannot be eaſily ſeparated. The reſt of the inflammables all contain phlegm, the vitriolic acid, an oil or inflammable matter and ſome earthy particles. The difference in the ſubtility of the mixed particles; the different proportions of the weight in the irmixtures; and the different ways of uniting them in one ſubſtance occaſion the differences which are obſerved in the various inflammables.

The fineſt vitriolic acid, mixed with alcohol and diſtilled, yields a ſubſtance like *naphtha*.

The union of a ſmall quantity of water and inflammable mixed with a little earth, together with a volatile vitriolic acid may perhaps generate *mountain oil.*

A mixture of inflammables with a little water, a greater quantity of earth and volatile vitriolic acid might probably yield *mountain-pitch*, *jet*, and *pitcoal.*

Yellow amber requires, beſides the above-mentioned ſubſtances, a kind of ſalt, generated by the intimate union of a vitriolic acid, with an inflammable, which is called *the acid of amber.*

Sulphur contains more than fifteen parts of vitriolic acid, mixed with a little phlegm and earth; and about one part of the inflammable principle.

The great quantity of vitriolic acid which is diſperſed among the various foſſils and minerals and the exiſtence of watery, earthy and oily particles in all ſubterraneous places affords a fair preſumption that the generation of inflammables may be accounted for in this manner.

Chap. VII.

Generation of metals.

As *metals* are compoſed of *earthy parts* of the greateſt ſubtilty, which therefore are capable of the ſtrongeſt coheſion, it is very natural that they ſhould conſiderably exceed the foſſils and minerals in weight and ſolidity: and as the *inflammable principle*, which penetrates the metals, is the fineſt and the moſt fixed, their ductility and toughneſs will likewiſe be greater; and as the ſubtle, volatile and penetrating parts of the *mercurial principle* are enabled to pervade the whole maſs, after that the acid of the inflammables has enlarged the earthy parts, for their reception; it is evident that from the nature of this whole mixture, the greater weight, denſity, opacity, ſplendor, coheſion, fuſibility and perfection of metals in general muſt ariſe.

The finer and more ſubtle the parts of the three principles are the better and more *perfect* is the compound.

The exacter the proportion of all the three principles one among another, the higher is the *perfection* of the compound.

The more fixed the inflammable and mercurial principles are, the greater are the coheſion, nobility and *perfection* of the compound.

The coarſer and greater the proportion of earthy parts in a metallic ſubſtance is, the leſs are its weight, ſolidity and coheſion.

The greater the proportion of inflammable parts in a metallic ſubſtance, the greater are its malleability, fuſibility and ſplendor.

The greater the proportion of the mercurial principle in a metallic ſubſtance, the greater are its weight, nobility, and perfection.

The integrant parts of metals, when diſſolved or volatilized, penetrate or adhere externally to ſome other foſſils, minerals and metals; or form jointly with them a new body, which is neceſſary to the conception, union, conſolidation, perfection, conſervation and extraction of the metals either native or mineralized; and ſuch bodies are called *the matrices of metals*. Theſe matrices are alſo generated by air, water, fire, and all the different poſſible operations of them.

Clefts, gang-work and its above-mentioned ſpecies and flat-work are in general *the matrices of metals*. In harder and denſer ſtones ſurrounding the cleft, the metals adhere only to the outſides; in ſtones of a looſer texture they are filtered and penetrate into their texture; and laſtly they ſometimes form a body with arſenic, ſulphur and other particles and fill a whole cleft.

The *particular matrices of metals* are other native or mineralized metals, (except tin-ore which is commonly by itſelf) ſemi-metals, pyrites or mundicks; the refractory and unyielding ſubſtances, as blend, ſherl, wolf-ram, wadd, calamine and manganeſe; earths, eſpecially the coloured ones; ſands, and moſt of the ſtone kind, as the common calcareous, ſome vitreſcent and ſome apyrous ſtones.

The *native metals* owe their generation to the mixture of the ſeveral component parts of the reſpective metal with antimonial, arſenical, or ſulphureous particles, or ſome of them united, in ſome ſuch manner as this: when the above-mentioned mixtures are raiſed by a proper degree of heat, the metallic particles, eſpecially of the nobler metals and of copper, begin to aggregate again into flakes, or ſpeckles, and, as it were by a kind of vegetation, form themſelves into hairs, leaves and even branches, according as the metallic vapours meet with a body ſuſceptible of ſuch ſhapes or not.

When the principles of a metallic ſubſtance are mixed with earthy, ſulphureous, arſenical or metallic particles belonging to a different metal, ſo as to compoſe a maſs quite different in appearance from their proper metal, and be hereby deprived, during this union, of ſome of its peculiar qualities, as for inſtance, its ductility, its readineſs in melting, opacity, ſplendor or coheſion, &c. then it is called *an ore* or *a mineralized* metal.

HALOTECHNIA:

OR,

TABLES on the Affinities of SALTS:

TRANSLATED FROM THE LATIN OF

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TABLE I.

Mineral salts are

1 Acids.
   a Fluid.
      α Vitriolic.
      β Muriatic.
      γ Nitrous.
   b Solid.
      Bituminous, as of yellow and grey amber, &c.
2 Alkaline.
   a Fixed.
   b Volatile.
3 Neutral compounded of acid and alkalines.
   a Acid of vitriol.
   b ——— Salt.
   c ——— Nitre.
   d ——— Bitumens.
   e Arſenic.
   f Borax.

TABLE

TABLE II.

ACID of VITRIOL acts upon

1 EARTHS.

It extracts out of the *clayey* kind a peculiar earth and forms with it *alum*, which with a phlogiſton conſtitutes the *pyrophorus.*

It diſſolves all *alcaline* earths, diſſolved in other acids to a *ſelenites*, which with a phlogiſton conſtitute the *Bononian phoſphorus*; the *liver of ſulphur*, and true *ſulphur*. When boiled with fixed alkali, it precipitates again the calcareous earth and forms *vitriolated tartar* and *ſal mirabile.*

The *ſelenitic earths* are not acted upon.

The *vitreſcible earths* are not acted upon; but when they are ſolved in a fixed alkali, they are precipitated.

Out of *all* the *earths* it extracts the metallic coppery, irony, zincky, &c. particles.

With *fat* and all the phlogiſtons, it conſtitutes *ſulphur.*

2 STONES.

It acts upon them in the ſame manner as upon earths and forms almoſt the ſame ſubſtances with them as are formed by the mixture of the earths with this acid.

3 SALTS.

a ACIDS.

The acid of *Salt* is volatilized.
------------- *Nitre* is volatilized.
------------- *Amber* is not acted upon.
------------- *Phoſphorus* is not acted upon.
------------- *Vegetables* is expelled from other bodies.
------------- *Ants* is acted upon.

b ALKALIS

With *vegetable fixed alkali* it forms the *vitriolated tartar*, the *arcanum duplicatum* and *ſal polychreſtum.*

With *mineral fixed alkali* it produces *ſal mirabile.*

From its mixture with urinous volatile alkali ariſes the *ſecreted ſal ammoniac.*

c **Neutral salts.**

From *common ſalt*
------ *digeſtive ſalt* } it expells
------ *fixed ammoniac ſalt* } *the acid of ſalt.*
------ *ſal ammoniac* itſelf }
------ *nitre* } it expells
------ *nitrum flammans* } *the acid of nitre.*

Terra foliata tartari and the *tartarus tartariſatus* it expells the *vegetable acid.*

It fixes in a certain manner the white cryſtaline *arſenic*; but when ſublimated by a greater degree of fire it produces cryſtals in tranſparency equal to *diamonds.*

With *borax* it produces the *ſedative ſalt.*

4 **Inflammable bodies.**

It acts not upon *common ſulphur.*

Out of *orpiment* it extracts ſomewhat of ſulphur.

It ſeparates *cinnabar* from its ſulphur and forms with the mercurial parts a kind of *turbith.*

It precipitates the *liver of ſulphur.*

5 **Metals.**

It diſſolves *gold* by ſome peculiar operations.

Silver is ſolved by oil of vitriol ſaturated with ſal ammoniac.

Horn-ſilver is rendered more volatile. Silver ſolved in acid of nitre is precipitated by it.

Copper is ſolved by it and produces the *vitriol of copper.*

Iron is ſolved and forms the *vitriol of iron.*

Tin is entirely ſolved with a hiſſing noiſe.

Lead likewiſe.

Zinc is ſolved with a great effervеſcence and produces the *vitriol of zinc.* Zinc precipitates all the metals ſolved in acid of vitriol.

Mercury forms with it a kind of *turbith.*

Cinnabar is partly and for a time fixed with it.

Regulus of antimony is partly ſolved.

Biſmuth and its ores are ſolved.

From *cobalt* it extracts the dying matter and forms together with it red cryſtals or the *vitriol of cobalt*, which infuſed with gall-apples does not extract the leaſt black colour.

Other Properties *of the* VITRIOL ACID.

It is the *heavieſt* of all acids.

It *fixes* in ſome manner the volatile metals, *viz.* mercury, lead, zinc, tutia, &c.

Fixed alkali, neutralized by the vitriolic acid, yields, with the addition of a phlogiſton, the *liver of ſulphur*.

The acid of vitriol precipitates all ſolutions made by the nitrous and vegetable acids. The *magiſteria* precipitated in this manner out of the acid of nitre are very ſubtle, but thoſe out of vinegar are ſplendent.

It volatilizes ſome of the metals diſſolved in the acids of nitre, ſalt and aqua regis.

The *bodies diſſolved* in this acid are very readily precipitated by the muriatic acid.

When diſtilled *with tartar* it expells the acid of tartar, and at the end of the operation it yields ſome ſulphureous matter.

This acid, taken from crude vitriol diſtilled with the oil of tartar, yields a milky liquor, which makes gold white.

With oily, gummy, reſinous bodies it yields a volatile ſulphureous ſpirit.

When poured on blood it deſtroys its red colour.

It forms with ox gall a bitter ſalt.

With camphire it makes a red tincture, which diſtilled produces a ſulphureous ſpirit.

With ſpirit of wine it is edulcorated in various manners.

With phlogiſton and the earth of alum it forms the pyrophori.

With common water it grows warm.

With ſteel filings and water it takes fire.

TABLE III.

ACID of NITRE acts upon

1 EARTHS AND STONES.

Out of the *clayey* kind it extracts the *earth of alum* and the moſt ſubtle *phlogiſton*.

It diſſolves the *alcaline earths*; with *chalk* it forms the *phoſphorus Balduini*.

The *ſelinitic earths* are not acted upon by it.

It extracts ſome *metallic* parts out of the *apyrous* and harder kinds of earth.

2 SALTS.

With *acid of ſalt* it makes *aqua regis*.

------ *Vegetable fixed alkali* it forms true *nitre* or *ſalt petre*.

------ *Mineral fixed alkali* it makes *cubic nitre*.

------ *Urinous alkali* the *nitrous ſal ammoniac* is produced.

When diſtilled with a dry *mineral volatile acid* it riſes by itſelf and at the end of the operation fulminates.

With *arſenic* diſtilled it yields a fine ſky-blue liquor.

Arſenic is partly fixed and partly diſſolved by it.

3 INFLAMMABLES.

Sulphur is not acted upon by it.

Inflammable bodies are diſſolved or the inflammable parts entirely extracted by it.

With *ſome of them* it breakes out into a flame.

With the *bituminous* and ſome of the *vegetable oils* it coagulates to a maſs like gum.

With *others of them* diſtilled or evaporated it fulminates.

Out of *orpiment* it extracts ſomething arſenical.

The *liver of ſulphur* is precipitated by it.

4 METALS.

Gold is not diſſolved.

Silver is diſſolved; ſo are
Copper,
Tin in part,
Lead,
Iron,
Mercury,
Biſmuth,
Zinc,
Regulus of antimony partly,
Regulus of cobalt.

The *metallic earth* for tinging the blue ſmalt is diſſolved.

Some other properties of the NITROUS ACID.

It commonly comes over in *red vapours.*

Diſtilled with *quick-ſilver,* it is green.

It is more corroſive than all the other acids.

It changes camphire into a fluid oil.

With ſilver, lead and quick-ſilver it ſhoots into cryſtals.

With iron and copper it goes into a maſs, which runs per deliquium.

Thoſe mineral calxes, which are precipitated by fixed alkali, it will not eaſily diſſolve.

When iron, lead and copper are diſſolved by it, and then evaporated, it fulminates very readily.

It is ſweetened by lead, and acquires a nauſeous taſte; this ſolution when precipitated with urinous ſpirits fulminates.

Mercury diſſolved in it, and haſtily evaporated turns red.

Out of crude antimony it extracts ſome ſulphureous parts.

The ſolution of ſilver in the nitrous acid with chalk generates the *ſcotophorus.*

When crude tartar is diſſolved in it, ſilver is then by this mixture ſeparated from gold, and the gold not affected.

Mixed with ſpirit of tartar it generates by certain operations the *dry volatile acid.*

A phial with this acid, put near a phial of urinous ſpirit emits white vapours.

It may be edulcorated with *alcohol* and then it yields an highly *volatile naptha.*

It diſſolves all animal parts, as hoof, hair, leather, nerves, &c. and when evaporated it fulminates.

TABLE IV.

ACID of COMMON SALT acts upon

I EARTHS and STONES.

It efferveſces with all *alkalines.*

With a *calcareous earth* it forms a *fixed ſal ammoniac,* the *oil of lime*, the *liquor of fixed ſal ammoniac*, and the *phoſphorus* of *Homberg*.

Selenitic earths and ſtones are not affected by it.

Out of a *clayey earth* it extracts the *aluminous earth*.

Out of the *vitreſcent* and *apyrous* earths and ſtones it extracts ſome *metallic* particles.

2 SALTS.

With the *nitrous acid* it makes *aqua regia*.

------ the *vegetable fixed alkali* it forms *ſal digeſtivum*.

------ *mineral fixed alkali* it forms *ſal commune*.

------ the *urinous volatile alkali* it forms the *regenerated ſal ammoniac*.

------ *arſenic* it yields the *oil* and *butter of arſenic*.

From *borax* it extracts the *ſedative ſalt*.

3 INFLAMMABLES.

It precipitates all the *ſulphureous ſubſtances*, which are diſſolved in *alkaline menſtrua*.

It ſeparates the *ſulphur* out of *orpiment*.

It precipitates the *liver of ſulphur*.

4 METALS.

Gold is not diſſolved by it alone.

Nor *ſilver*: but when it is diſſolved in nitrous acid, it is precipitated by the acid of ſalt and changed into *luna cornua*, or *horn-ſilver*.

Copper and its *calx* are diſſolved and yield a green tincture.

Tin is almoſt diſſolved.

Lead is not diſſolved, but changed into *plumbum cornuum*, when previouſly diſſolved in the nitrous acid.

Iron is diſſolved.

Regulus of antimony is diſſolved and the ſolution yields the *butter of antimony*.

Regulus of arſenic is partly diſſolved in it by boiling.

---------- *Cobalt* is not ſoluble.

Mercury is not ſoluble by it alone.

Zinc is ſoluble.

Regulus of biſmuth is diſſolved in it by digeſtion.

The pureſt *metallic earth* for tinging the blue ſmalt is quite diſſolved in it.

General Properties of the ACID *of* SALT.

It is the moſt volatile of all acids.

It emits white vapours.

All the *crocus's of metals*, generated by it, are ſtyptic.

All bodies diſſolved in it are precipitated by *oil of vitriol.*

Spirit of wine edulcorates it.

The dulcified acid of ſalt diſſolves all the calxes of gold, except that which is made with ſulphur.

It is the moſt concentrated in the ſublimate of mercury, butter of antimony and oil of arſenic.

It volatalizes ſome metals.

It diſſolves the diaphoretic antimony.

It is edulcorated in the beſt manner by a ſufficient quantity of mercury.

TABLE V.

AQUA REGIS is formed by a mixture of the *acid of ſalt* with the *acid of nitre.*

It ſolves the *alcaline* earths.

The *ſelenitic* earths are not at all affected by it.

Out of the *clayey* kind it extracts the *earth of alum.*

Out of the *apyrous* and *vitreſcent* earths it extracts ſome particles.

The ſame phoenomena appear with the ſtones of the above-mentioned kinds.

It diſſolves *gold.*

It diſſolves the *platina.*

———— *copper.*

———— *iron.*

———— *tin*: this ſolution yields with the ſolution of gold the *mineral purple.*

It diſſolves *lead.*

——— *Mercury.*
——— *Regulus of antimony.*
——————— *Cobalt.*
——————— *Biſmuth.*
——— *Zinc.*
——— *Arſenic.*
——— The *metallic earth* for tinging blue ſmalt.

TABLE VI.

Fixed mineral alkali, in reſpect of

1 Earths and stones.

With quick-lime it forms a *cauſtic alkali.*

Things diſſolved in acid are precipitated by it.

Mixed with *vitreſcent ſtones* and *earths* it yields the fineſt glaſſes.

It promotes the fuſion of many metallic earths and ſtones.

2 Inflammables.

It diſſolves *ſulphur* in the dry and in the wet way.

It ſeparates the mercury from *cinnabar* by diſtillation.

With *quicklime* and *expreſſed oils* and *fats* it forms a ſharp ſoap.

Orpiment when ſublimated with it, depoſites its ſulphureous parts at the bottom, but the arſenic makes a white ſublimate.

It facilitates the rectification of ſpirit of wine, as well as the *fixed vegetable alkali.*

3 Salts.

It efferveſces with all acids and is diſſolved in them.

With *acid of vitriol* it makes the *ſal mirabile.*

With *acid of ſalt* it makes the *common ſalt.*

With *acid of nitre* it makes the *quadrangular ſalt petre.*

From *ſal ammoniac* it expells an *urinous ſpirit.*

Out of a ſolution of *alum* it precipitates an earth.

With the *volatile ſalt of amber* it yields a peculiar neutral ſalt.

4 Metals.

It promotes ſtrongly the fuſion of metals.

It precipitates all metals diſſolved in acids, and with gold generates the *aurum fulminans*.

It revives the *luna cornua* without loſs.

It revives *quick-ſilver* out of the mercurial ſalts.

It makes *antimony*, by certain operations, malleable and fit for amalgamation.

It yields a green ſcoria when fuſed with antimony and a vitreſcent earth.

It precipitates the watery ſolution of the ſublimate of mercury in an orange colour.

The other qualities of the fixed MINERAL ALKALI.

It does not run per deliquium, as the vegetable alkali moſt commonly does, but only crumbles into a powder.

It runs per deliquium, when calcined with the calcareous earth of quick-lime.

It ſhoots into very beautiful cryſtals.

One pound of theſe cryſtals contains ten ounces of water.

When diſtilled with vinegar, it ſhoots into oblong cryſtals, which are not ſoluble in the free air, like the foliated earth of tartar.

With *cream* or *cryſtals of tartar* it makes the *ſal ſeignette*.

With nitre and ſulphur it makes a thunder powder.

It precipitates the metals diſſolved in the various acids.

TABLE VII.

MINERAL VOLATILE ALKALI in reſpect of

1 EARTHS AND STONES.

It volatilizes the *alcaline earths*.

It precipitates earths and ſtones diſſolved in acids.

2 SALTS.

It efferveſces with *acids* and forms a *neutral ſalt*.

With *acid of vitriol* it forms the *ſecreted* or *vitriolic ſal ammoniac*.

With *acid of ſalt* it forms the *regenerated* or *common ſal ammoniac*.

With *acid of nitre* it forms the *nitrous ſal ammoniac*.

With *acid of amber* a kind of *volatile alkaline ſpirit* riſes and at length a certain ammoniacal concretion is formed.

It is expelled from minerals by the fixed vegetable, as well as mineral alkali.

It precipitates from the metallic ſalts generated by acids, the metallic parts, eſpecially the ſublimate of mercury diſſolved in water is precipitated with a white colour. Gold precipitated in this manner, becomes *aurum fulminans.*

White arſenic is diſſolved in it.

3 INFLAMMABLES.

It abſorbes and volatilizes with itſelf the *æthereal oils* eſpecially of the vegetable kind.

4 METALS.

It precipitates metals diſſolved in acids.

It diſſolves copper and makes a blue tincture.

TABLE VIII.

VITRIOLIC COMPOUND SALTS are

1 Of the METALLIC kind.

a Of the IRON kind.

When diſſolved they change *calcareous earths* into a *ſelenites.*

With *alcaline earths* they leave their irony parts.

They coagulate the *liquor ſilicum.*

They produce a fine philoſophical vegetation with the liquor of ſal ammoniac.

It expells the *acid* out of many *neutral ſalts.*

The calcined *vitriol of iron* yields by diſtillation the *concentrated acid of vitriol.*

When wrought with *inflammables* it yields *ſulphureous ſubſtances.*

It precipitates *gold* and *other metals* and minerals out of their ſolutions made by *acids.*

The *irony parts* may be precipitated in the beſt manner out of their ſolution by means of *zinc.*

The infuſion of turky gall-apples turns immediately black with it.

b The COPPER kind.

Theſe vitriols are blue.

Alkalines precipitate their metallic parts.

Copper is precipitated in its metallic form out of this vitriol by means of iron.

In regard to other things they agree with the vitriol of iron.

c The ZINC kind.

Theſe vitriols are white or roſe-coloured.

Alkalines, eſpecially quick-lime, precipitate the zinc of this vitriol very readily.

By certain operations, zinc in its metallic form may be diſtilled out of this precipitate.

They agree with the foregoing vitriols in other things.

d The COBALT kind.

Theſe vitriols are red.

They tinge not the infuſion of gall-apple black.

In other reſpects they are like the other vitriols.

2 Of the SALINE OR NEUTRAL kind.

a The PURE SAL MIRABILE.

It is white and has a bitter taſte.

It melts very readily in fire.

When expoſed to the air it moulders into a powder.

With a *phlogiſton* it yields a *liver of ſulphur*.

It precipitates the *ſelenites* out of a ſolution of calcareous earth in *acid*, and the lie ſwimming at the top yields *quadrangular nitre*.

b The IMPURE SAL MIRABILE.

It precipitates various *metals* diſſolved in *nitrous acid*.

It is mixed with earthy particles.

Therefore it moulders not ſo eaſily into a powder.

When diſſolved in water and filtred, ſome earthy particles are ſeparated from it.

It has a more bitter taſte, than the firſt.

In reſpect to other things it exhibits pretty much the ſame phænomena as the pure ſal mirabile.

3 Of the EARTHY kind.

a ALUM.

Has in the beginning a ſweetiſh but afterwards a ſtyptic and nauſeous taſte.

When diſſolved it depoſites its earth by the addition of *alkaline ſalts.*

When expoſed to the heat it loſes its tranſparency.

Under calcination it puffs up like borax and at laſt crumbles into a powder.

It forms almoſt with every *phlogiſton* a *pyrophorus.*

It expels the *nitrous* and *muriatic acid,* in the ſame manner as vitriol does.

When diſtilled with *arcanum duplicatum,* it yields a *ſulphureous volatile ſpirit.*

b SELENITES.

They are of a rhomboidal figure.

They do not effervеſce with *acids* and are not diſſolved by them.

When boiled in water they diſſolve.

When calcined with *phlogiſton* they yield a *liver of ſulphur.*

When put upon burning coals and calcined with caution, they acquire the power of attracting the luminous parts of light.

They promote the fuſion of different *minerals.*

TABLE IX.

COMMON SALT in reſpect of

1 EARTHS and STONES.

Theſe are not acted upon unleſs ſome other ſalts are joined to them.

2 OTHER SALTS.

By the *vitriolic acid* it is deprived of its *acid* and the remaining maſs is a *ſal mirabile.*

With *acid of nitre* it conſtitutes *aqua regia* and when diſtilled with it, the *quadrangular nitre* remains at the bottom.

When diſtilled with the *vitriolic neutral ſalt* it yields its acid.

It purifies *arſenic* and forms its white cryſtals.

3 INFLAMMABLES.

With *ſulphur*, *ſulphureous* and *vitriolic ores* or *mundicks* it yields its acid.

The other *mineral inflammables* are not acted upon at all.

4 METALS.

It precipitates the *luna cornua*, and *ſaturnus cornuus* out of the *ſolutions of ſilver* and *lead* in the nitrous acid.

It promotes the fuſion of other *metals* and volatilizes ſome of them, not by means of its neutral nature, but its acid.

TABLE X.

NITRE in reſpect of

1 EARTHS and STONES.

It *fulminates* with the greater part of them and becomes *alkaline*.

Some earths and ſtones are diſſolved by it.

Some of them are calcined and various phænomena ariſe from theſe combinations.

2 OTHER SALTS.

All *vitriolic ſalts*, *borax*, *alum*, &c, deprive it of its *acid*.

When diſtilled with *arſenic* it yields a *blue ſpirit*.

3 MINERAL INFLAMMABLES.

It *fulminates* with all of them and is *alkalized*.

4 METALS.

It purifies *gold* and *ſilver*.

When melted with *copper* it is *alkalized* and the copper is partly corroded by it.

By *zinc*, *lead*, *iron*, *biſmuth*, and *zinc* it is *alkalized*.

When diſtilled with *quick-ſilver* it yields *green vapours*.

With *antimony* it fulminates and changes its reguline parts into a white or yellow calx proportionable to the weight of the nitre employed.

TABLE XI.

BORAX.

It diſſolves and vitrifies many of the *earths* and *ſtones* when melted with them.

When diſtilled with *vitriolic*, *nitrous* and *ſaline* acid and *vinegar* it yields the *ſedative ſalt*.

It expells the *nitrous acid*.

It expells the *urinous parts* out of *ſal ammoniac*.

It precipitates the aluminous earth.

The ſolution of ſublimated mercury in water is precipitated with an *orange-colour*.

It promotes wonderfully the fuſion of the metallic calxes.

Gold melted with it turns pale.

It precipitates the ſolution of *ſilver* in nitrous acid.

- - - - - - *Copper* in the nitrous and muriatick acids.

- - - - - - *Vitriol of copper*, *iron*, *zinc* and *cobalt*.

- - - - - - *Sugar of lead*.

- - - - - - *Verdegreaſe*.

- - - - - - *Liver of ſulphur*.

- - - - - - *Quick-ſilver* in the nitrous acid.

- - - - - - *Iron* in aqua regis and the muriatic acid.

- - - - - - *Zinc* }
- - - - - - *Biſmuth* } in the nitrous acid.

It turns the ſyrup of violets *green*.

TABLE XII.

ARSENIC.

It is purified by being ſublimated with *alkaline earths*.

It promotes the fuſion of many *earths* and *ſtones* provided it is mixed previouſly with other alkaline fluxes.

When ſublimated with *oil of vitriol* it yields the fineſt *flowers*.

With the *muriatic acid* it yields *butter of arſenic.*

It is ſoluble in the *nitrous acid.*

- - - - *Spirit of ſal ammoniac.*

- - - - *Oil of tartar* per deliquium.

When diſtilled with *nitre* it yields a blue ſpirit.

When melted with *nitre* it is partly fixed and called *fixed arſenic* and this attracts the moiſture of the air.

It riſes in the greateſt purity when ſublimated with *common ſalt.*

When boiled in water it diſſolves, and ſhoots again into cryſtals.

With a *phlogiſton* it yields a *metallic regulus.*

When ſublimated with *ſulphur* it yields *orpiment.*

Gold melted with it turns pale.

Silver is not acted upon by arſenic.

Copper melted with it turns *white.*

With *iron* it yields the *white pyrites.*

When melted with *tin* and *lead* they are *hardened.*

When diſtilled with *ſublimated mercury* it yields *butter of arſenic.*

A TABLE
OF THE
SPECIFIC GRAVITIES
OF
MINERAL BODIES,
COLLECTED FROM VARIOUS AUTHORS.

Fine gold	H.	20. 666.
-	W F. M.	19. 639.
Standard gold	F.	18. 887.
Gold of a guinea of K. George II.	F.	17. 793.
-	M.	17. 150.
Gold of a moidore	M.	17. 140.
Platina	Dr. Lewis.	17. 200.
-		16. 500.
Quick-ſilver	H.	14. 126.
- - - ſublimated 511 times	M.	14. 110.
- - - crude	M. W.	13. 593.
-	F.	13. 565.
Lead	H.	11. 872.
-	W.	11. 325.
-	F.	11. 310.
Fine ſilver	F.	11. 090.
Standard ſilver	F.	10. 534.
Silver of a ſhilling of K. George II.	M.	10. 000.
Biſmuth	W.	10. 000.
-	M. W.	9. 700.
-	H.	9. 073.
Copper	M. H. W.	9. 000.
	W.	8. 784.

Regulus

Regulus of arſenic	W.	8. 308.
Iron	W.	8. 000.
Steel tempered	M.	7. 704.
Iron	H.	7. 696.
	M.	7. 645.
Cubic lead-ore	H.	7. 591.
Tin	M.	7. 550.
Cryſtaline lead-ore	H.	7. 540.
Regulus of antimony	W.	7. 500.
Native cinnabar in grains	H.	7. 489.
Tin	W.	7. 471.
		7. 320.
Silver-ore from Wales	M.	7. 364.
Copper	H.	7. 440.
Native cinnabar	M.	7. 300.
Coarſe native cinnabar	H.	7. 294.
Fine tin	H.	7. 200.
Lead-ore in large cubes	H.	7. 200.
Spelter or zinc	M.	7. 065.
Shard cobalt	H.	7. 018.
Regulus of antimony made with copper	H.	7. 018.
Zinc	H.	7. 018.
	W.	7. 000.
Cobalt from Rudolſtadt in Saxony	H.	6. 930.
Lead-ore with ſmall cubes	H.	6. 888.
Tin cryſtals	H.	6. 846.
Lead-ore	M.	6. 800.
Regulus of antimony made with iron	H.	6. 488.
Regulus antimonii ſtellatus	H.	6. 413.
Biſmuth-ore	H.	6. 340.
Glaſs-ſilver-ore	H.	6. 305.
Cobalt from Shneeberg in Saxony	H.	6. 065.
Red-gilder-ore	H.	6. 000.
White pyrites from the Kuhſhaft in Saxony	H.	5. 873.
Common cobalt	H.	5. 782.
Shard cobalt	H.	5. 602.

White

White pyrites from the ſhaft called Himmelsfurſt in Saxony	H.	5. 264.
Lapis calaminaris - - - - -	M.	5. 000.
Cryſtaline arſenic - - - - - -	W.	5. 000.
Quick-ſilver-ore from Hungary after being macerated in water	H.	4. 899.
Solid pyrites from Temeſwar in Hungary -	H.	4. 789.
Yellowiſh pyrites from the ſhaft called Zug in Saxony	H.	4. 748.
Yellowiſh pyrites from the ſhaft called the braſs ſerpent in Saxony	H.	4. 798.
Crude antimony - - - -	M. W.	4. 700.
		4. 000.
Yellowiſh pyrites from Sweden - -	H.	4. 689.
Iron pyrites from Haſſia - - -	H.	4. 650.
A golden marcaſite - - - -	M.	4. 589.
Yellow pyrites from Sweden - - -	H.	4. 573.
Yellowiſh pyrites from Halſbruck in Saxony -	H.	4. 555.
Yellowiſh pyrites from Johan Georgenſtadt in Saxony	H.	4. 553.
Black arſenic in powder (macerated) - -	H.	4. 536.
Pyrites from Pretchendorf in Saxony - -	H.	4. 513.
Mundick or gold ſpar - - -	M.	4. 430.
Blood-ſtone or hæmatites - - - - -	H.	4. 428.
Garnet tin-ore from Bohemia - - -	H.	4. 376.
Lapis hæmatites - - - - -	M.	4. 360.
A Bohemian Garnet - - - -	M.	4. 360.
Shard cobalt from Shneeberg in Saxony -	H.	4. 342.
Copperas ſtone - - - - - - -	M.	4. 300.
Pyrites from Temeſwar (macerated) - -	H.	4. 292.
Pyrites from the ſhaft called Yæger in Saxony -	H.	4. 275.
A pſeudo-topaz - - - -	M.	4. 270.
Cubic ſpar - - - - - -	W.	4. 266.
Pyrites from Tœplitz in Bohemia - -	H.	4. 164.
White ſpar from the mine called Segen-gottes in Saxony	H.	4. 148.
Globoſe pyrites from Andreaſberg in the German ſtates of the King of Great Britain - - - -	H.	4. 000.
Antimony from Germany - - -	M.	4. 000.

Swediſh granite	M.	3. 978.
Arſenical pyrites mixed with tin	H.	3. 971.
Yellowiſh pyrites from the Hartz foreſt	H.	3. 888.
Solid black iron-ore from the ſhaft called Kuhnheide in Saxony	H.	3. 875.
Antimony-ore	H.	3. 865.
Large garnets	H.	3. 865.
Yellow pyrites from Neuſtadt in Saxony	H.	3. 865.
Copper-ore from Rudolſtadt in Saxony	H.	3. 821.
Crude antimony	H.	3. 795.
Copper-ore	M.	3. 775.
Copper-ore from Temeſwar	H.	3. 683.
Black-jack	H.	3. 671.
Yellow pyrites from the ſhaft called Lorentz in Saxony	H.	3. 611.
Kidney-ſtone	M.	3. 600.
Sardachates	M.	3. 598.
Pyrites from the ſhaft called Krœner in Saxony	H.	3. 588.
White arſenic	H.	3. 554.
Small garnets	H.	3. 542.
Loadſtone (macerated)	H.	3. 509.
Blueiſh grey ſlate	W.	3. 500.
Yellow arſenic	H.	3. 498.
Precious ſtones	W.	3. 450.
Star-ſtones	M.	3. 450.
Lapis de tribus (ſulphur, arſenic and antimony)	H.	3. 444.
Black lead	H.	3. 433.
Diamond	M.	3. 400.
Sand-ſtone	W.	3. 300. 3. 200.
Cornelian	W.	3. 290.
Orpiment	H.	3. 234.
Lapis lazuli	W. H.	3. 054.
Red brown arſenic	H.	3. 040.
Lively red arſenic	H.	3. 032.
Chryſocolla or mountain green	H.	3. 008.
Talc from Jamaica	W. H.	3. 000.
Red arſenic	H.	2. 929.

Lapis amianthos or aſbeſtos from Wales	M.	2. 913
Hip ſtones or lapis nephriticus	W. M.	2. 894.
White fine whet ſtone	H.	2. 839.
Common lime-ſtone	W.	2. 810.
Talc of Venice	M.	2. 780.
Slat	M.	2. 740.
Blue ſtone	M.	2. 740.
Black table ſlate	W.	2. 730.
Armenian bole or clay	M.	2. 727.
Iceland cryſtals	M. W.	2. 720.
A fine Italian marble	M.	2. 718.
Fine marble	W.	2. 710.
White Italian marble	M.	2. 707.
Black Italian marble	M.	2. 704.
An other fine marble	M.	2. 700.
Garnet-ore from Pirna in Saxony	H.	2. 695.
A pſeudo jaſper	M.	2. 666.
Rock cryſtals	M.	2. 659.
Talc	M.	2. 657.
A pellucid pebble	M.	2. 641.
Common flint	W.	2. 640.
		2. 540.
A pſeudo hyacinth	M.	2. 631.
Plumoſe alum	H.	2. 625.
Coralachates	M.	2. 605.
Quartz	W.	2. 600.
Ruddle or red lead (macerated)	H.	2. 595.
Agate	W.	2. 572.
Quartz from Rudolſtadt in Saxony containing gold	H.	2. 571.
A cornelian	M.	2. 568.
Aëtites or eagle-ſtone	H.	2. 559.
Flint	M.	2. 542.
Lime-ſtone	H.	2. 542.
Red marble	H.	2. 519.
An Engliſh agate	M.	2. 512.
Onyx ſtone	W. M.	2. 510.
Briſtol-ſtone	M.	2. 510.

Turcois

Turcois-ſtone	M.	2. 508.
Fine black whet-ſtone	H.	2. 507.
Cryſtal	W.	2. 500.
Lapis Judaicus or a petrified ſpike of a ſea-egg	M.	2. 500.
Slate	H.	2. 496.
Rag-ſtone	M.	2. 470.
Hard paving ſtone	M.	2. 460.
Red jaſper	H.	2. 458.
Chalk from Coelln upon the Rhyne	H.	2. 452.
Pebbles out of the river Elbe	H.	2. 447.
Quartz	H.	2. 442.
Agate	H.	2. 442.
Wood mineralized with iron-ore	H.	2. 431.
White marble	H.	2. 426.
Chalcedony from Zwickau	H.	2. 420.
Rock-cryſtal with holes or hollow cryſtal	H.	2. 410.
Spar cryſtals found in the cavities of marbles in Hungary	H.	2. 400.
An Ammonites	H.	2. 389.
An hone	M.	2. 388.
A Belemnites	M.	2. 384.
Oil-ſtone	M.	2. 380.
Chalk	M.	2. 370.
Coral-ſtone	H.	2. 369.
Serpentine-ſtone	H.	2. 369.
Amianth from Italy	M.	2. 360.
Horn-ſtone flint	H.	2. 354.
Amianth from the ſerpentine quarry at Zœblitz in Saxony	H.	2. 349.
Petrified wood	M.	2. 341.
Selenites	W. M.	2. 322.
Slates for whet-ſtone	W.	2. 300.
Stones from the Prudelwell at Carlſbad in Bohemia	H.	2. 188.
Sal polychreſtum	M.	2. 148.
Sal gemmæ or rock-ſalt	M.	2. 148.
Glacies mariæ	H.	2. 113.
Cat-ſilver	H.	2. 089.
Burford ſtone	M.	2. 049.
Native ſulphur	M.	2. 000.

Rotten-ſtone	M.	1. 980.
Brown talc	H.	1. 910.
White vitriol	M.	1. 900.
Nitre	M.	1. 900.
Salt of vitriol	M.	1. 900.
Gypſeous ſtone	W.	1. 900.
Stone marle (macerated)	H.	1. 884.
Engliſh vitriol	M.	1. 880.
Alabaſter	W. M.	1. 873.
Native ſulphur	H.	1. 872.
Opal	H.	1. 841.
Load ſtone or magnet	M.	1. 840.
Crude or common ſulphur	M. H.	1. 804.
Borax	M.	1. 720.
Vitriol from Dantzig	M.	1. 715.
Alum	M.	1. 714.
Verdegreaſe	M.	1. 714.
Oil of vitriol	M.	1. 700.
Spirit of nitre rectified	M.	1. 610.
Aphronitrum	H.	1. 520.
Common ſpirit of nitre	M.	1. 315.
Solid artificial peat	(*Alexander Lind in the Edinburgh Eſſays*)	1. 303.
Aquafortis	M.	1. 300.
Common ſea-coal	M.	1. 300.
Pit-coal near Edinburgh	M.	1. 287.
Pit-coal	H.	1. 271.
Jet	M.	1. 238.
Aqua regis	M.	1. 234.
Pumice ſtone (macerated)	H.	1. 229.
Spirit of vitriol	M.	1. 203.
Spirit of ſea ſalt	M.	1. 130.
Jews pitch	H.	1. 072.
Amber	M.	1. 040.
Spirit of amber	M.	1. 030.
Sea water	M.	1. 030.
River water	M.	1. 009.
Rain water	F. H. W. M.	1. 000.

Well or ſpring water	M.	0. 999.
Diſtilled water	M.	0. 993.
Oil of amber	M.	0. 978.
Yellow tranſparent amber	M.	0. 969.
Spirit of wine rectified	M.	0. 866.
Ethereal ſpirit of wine	M.	0. 762.
Fixed air from calcareous ſubſtances. *Phil. Tranſ.*		0. 537.
Common air	F.	0. 001.
Inflammable air from metals and fermentations *Phil. Tranſ*		.0. 000.

Note. *The letter* W. *ſignifies Wallerius's Mineralogy*; *the letter* H. *Henckel's Pyritology*; M. *Martyn's Philoſophia Britannica*; F. ***Ferguſon's*** *Tables.*

A VIEW
OF THE
MINERAL BODIES
CONSIDERED AS
CONDUCTORS of ELECTRICITY,
TAKEN FROM
DR. JOSEPH PRIESTLEY'S HISTORY of ELECTRICITY.

1 STONY SUBSTANCES.

Stony ſubſtances in general conducted very well, though dry and warm.

Lime ſtone and *lime* juſt burnt were equally imperfect conductors.

Marbles conducted conſiderably better than freeſtone and there was found very little difference among any of the ſpecimens of marble that were tried.

A large piece of *white ſpar* with a tinge of *blue* and ſemitranſparent would hardly conduct in the leaſt degree: pretty ſtrong ſparks were taken from the prime conductor, while it was in contact with it.

A piece of *agate* though ſemipellucid received the electrick ſpark into its ſubſtance; though it would paſs over about three quarters of an inch of its ſurface to reach the finger that held it, and it diſcharged the battery but ſlowly.

A piece of *ſlate*, ſuch as is commonly uſed to write on, was a much better conductor than a piece of *free ſtone*, which conducted but poorly.

Touch ſtone conducted pretty well.

A piece of *gypſum* and *plaiſter of Paris* conducted pretty well, only the latter having a ſmoother ſurface took a ſtronger ſpark.

A piece of *aſbeſt* from Scotland juſt as it is taken from its bed, would not conduct. It was in contact with the conductor, while ſparks were taken at the diſtance of half an inch with a moderate electrification.

A piece of *Spaniſh chalk* conducted pretty much like marble.

A piece of *Egyptian granite* conducted conſiderably better than free ſtone.

2 Saline bodies.

Oil of vitriol conducted pretty well.

The *metallic ſalts* in general conducted better than any neutrals.

Vitriol of copper and of *iron* conducted very well, though they would not tranſmit a ſhock.

Vitriolated tartar gave a ſmall ſhock.

Salt-petre did not conduct ſo well as ſal ammoniac. Endeavouring to make the electric exploſion paſs over its ſurface it was diſperſed into a great number of fragments in all directions with conſiderable violence ſome flying againſt the Doctor's. face.

Volatile ſal ammoniac gave a ſmall ſhock.

Rock ſalt conducted pretty well but not quite ſo well as alum; the electric ſpark upon it was peculiarly red.

Sal ammoniac exceeded rock ſalt and alum in its conducting powers, but it would not take the leaſt ſenſible ſpark; ſo that it ſeemed made up of an infinite number of the fineſt points.

Selenitic ſalts conducted but poorly.

By *alum* the exploſion was attended with a peculiar hiſſing noiſe, like that of a ſquib.

3 Inflammable bodies.

A piece of *pyrites*, of a black colour, took ſparks at a conſiderable diſtance from the prime conductor, like ſome of the inferior pieces of charcoal.

Another piece of *pyrites*, which has been part of a regular ſphere, conſiſting of a ſhining metallic matter, did not conduct near ſo well, though much better than any other ſtony ſubſtance. It was a medium betwixt a ſtone and an ore.

Black lead in a pencil conducted a ſhock ſeemingly like metal or charcoal. A ſmall lump of it took as full and ſtrong a ſpark from the prime conductor, as a braſs knob.

4 **Metals and ores.**

A piece of *gold ore* from Mexico was hardly to be diſtinguiſhed in this reſpect from the metal itſelf.

A piece of *ſilver ore* from Potoſi, though mixed with pyrites conducted very well.

Two pieces of *copper ore*, one the moſt valuable that is known, and another only of about half the value, were hardly to be diſtinguiſhed from one another, in their conducting power.

Lapis hæmatites conducted pretty well.

Black ſand from the Coaſt of Africa, which is a good *iron ore*, and part of which is affected by the magnet as much as ſteel filings, is found to conduct electricity, but not a ſhock. Separating with the magnet all that would be eaſily atracted by it, it conducted a ſhock very well; the reſt would hardly conduct at all.

Even the *ores* in which the metal is mineralized with ſulphur or arſenic, as the *ores* of *lead* and *tin*, and *cinnabar* the ore of quick ſilver, were little inferior to gold and ſilver ore.

Ores that contain nothing but the earth of the metal, conduct electricity but little better than other ſtones; though the Doctor thought that all the ſpecimens of *iron ore* that he tried, conducted better than marble.

The Doctor found by trials that the conducting power of different metals themſelves was very different; and it appeared that they may be ranged in this order.

Lead, tin, iron, braſs, copper, ſilver, gold.

Electric bodies.

Amber, jet, pitch and *ſulphur*; likewiſe all the precious ſtones *diamond, rubies, garnets, topazes, hyacinths chryſolites, emeralds, ſaphires, amethyſts, opals* and eſpecially *tourmalins*, are electric bodies.

BRITISH MUSEUM

E R R A T A.

Page 71. line 7. *after the word earths read,* thoſe which are. *After the word acids, add,* it precipitates.